ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION

NOVEMBER 11, 1948

Trash racks for world's largest pumping plant at [illegible]

WITH ARTICLES ON

SURGE TANKS TO RESIST EARTHQUAKES

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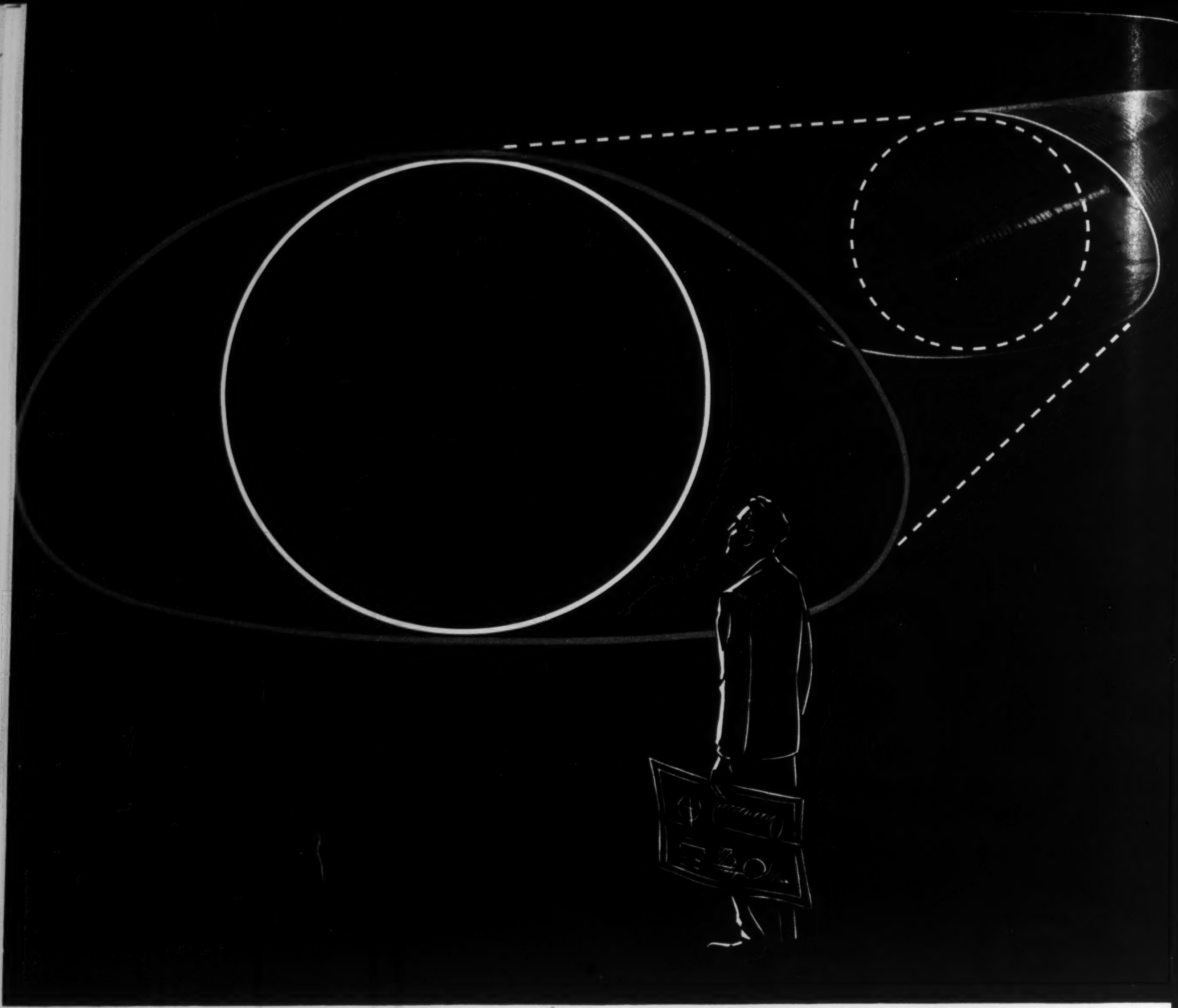

"Stop Thinking in Circles!"

Installing full-round drainage pipe under certain conditions—limited headroom, for example—often called for extra work and expense. Then ARMCO engineers said: "Stop thinking in circles—there's a better way."

They developed ARMCO PIPE-ARCH—a new type of corrugated metal structure that proved ideal under limited headroom. The greatest effective waterway area is in the bottom—right where it is needed for fast, unrestricted runoff. You get adequate drainage without raising the grade or installing several smaller openings. ARMCO PIPE-ARCH has ample strength under shallow cover, requires less excavation, is easy to handle and install. Prefabricated, individual lengths are shipped as a unit and joined with sturdy band couplers. You save time, money and labor.

Creating better products to meet specific needs has been the objective at ARMCO for more than 40 years. A few examples are HEL-COR Perforated Pipe, STEELOX Buildings and sturdy MULTI-PLATE Bridges.

Today you can bring your drainage and construction problems to ARMCO with full assurance you will receive all the benefits of long experience, extensive research facilities, and a real interest in helping you solve your most difficult problems.

ARMCO has a complete range of engineered products and convenient, authoritative data to help you. If your problem is unusual why not talk it over with our engineers.

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Denver, Colorado ★ Des Moines, Iowa ★ Topeka, Kansas ★ Minneapolis, Minnesota
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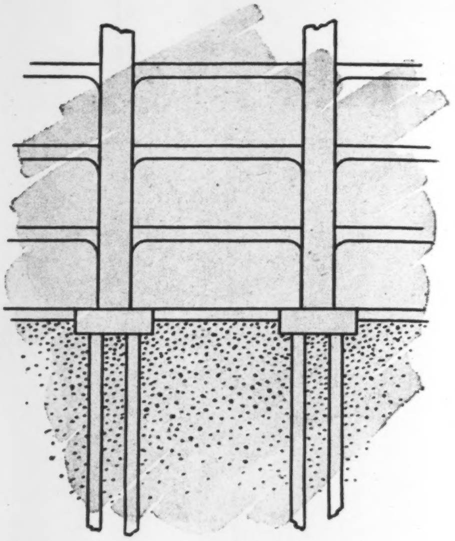
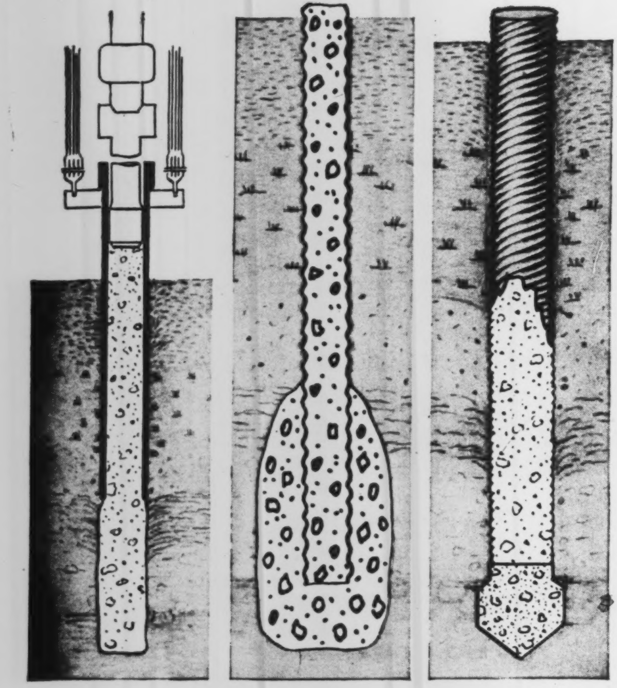
ADVANCED ENGINEERING UTILIZES

CYLINDRICAL COLUMNS

Western uses cylindrical piles





Left: Compressed Concrete Pile—A cylindrical pile of great carrying strength.
Center: WESTERN type Pedestal Pile — Enlarged base affords unusual load capacity.
Right: Button Bottom Pile—Greater diameter base increases bearing value.

LIKE A COLUMN, a foundation pile transfers its load to the base on which it rests. The larger the base, the greater the carrying capacity. Thus, a truncated cone will stand up on its wide base on soil of a given bearing value but will settle if inverted.

Compressed Concrete Piles have bearing capacities up to 80 tons. In cases where the bearing value of the soil is such that the diameter of the shaft does not provide sufficient carrying capacity, WESTERN enlarges the base by forming a pedestal. Another WESTERN pile that utilizes the enlarged base is the Button Bottom Pile. WESTERN provides adequate END bearing to carry the load; what is gained by skin friction is an additional safety factor.

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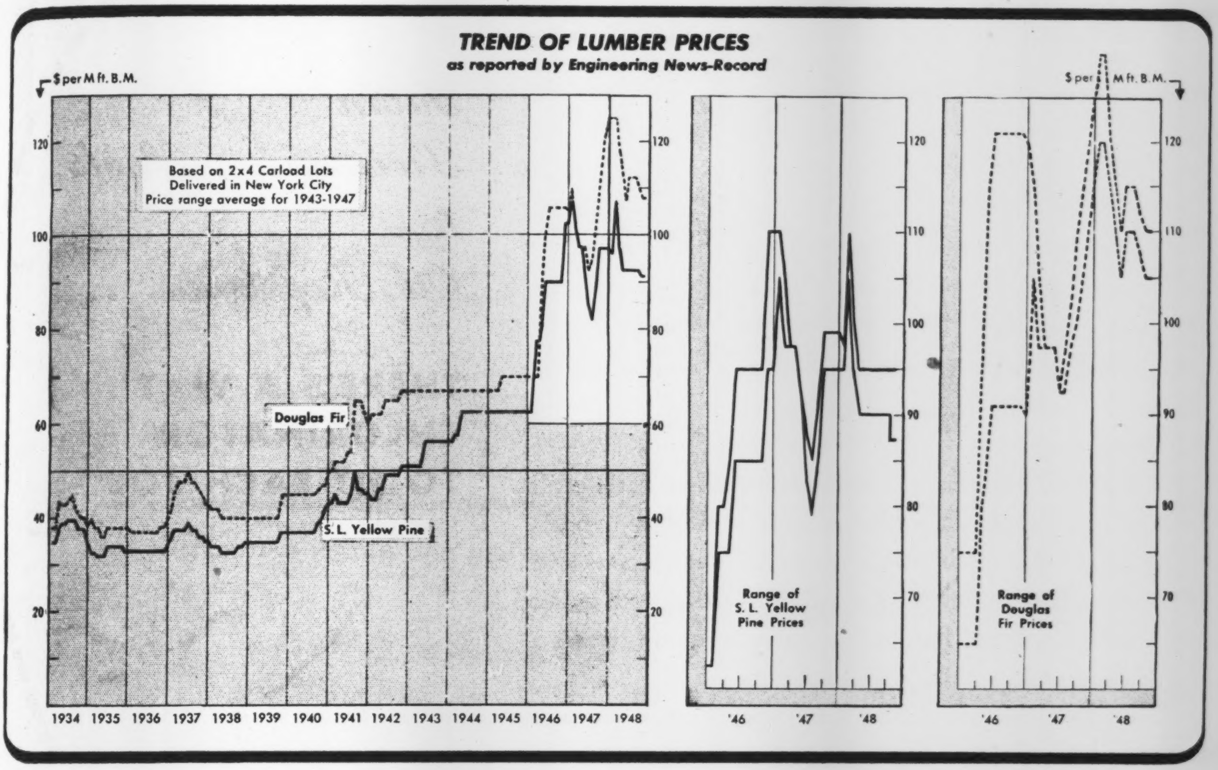

TREND OF LUMBER PRICES

as reported by Engineering News-Record

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In addition, the maritime strike on the West Coast has limited shipments by water. Thus, a temporary abundance of lumber was made available for inland uses.

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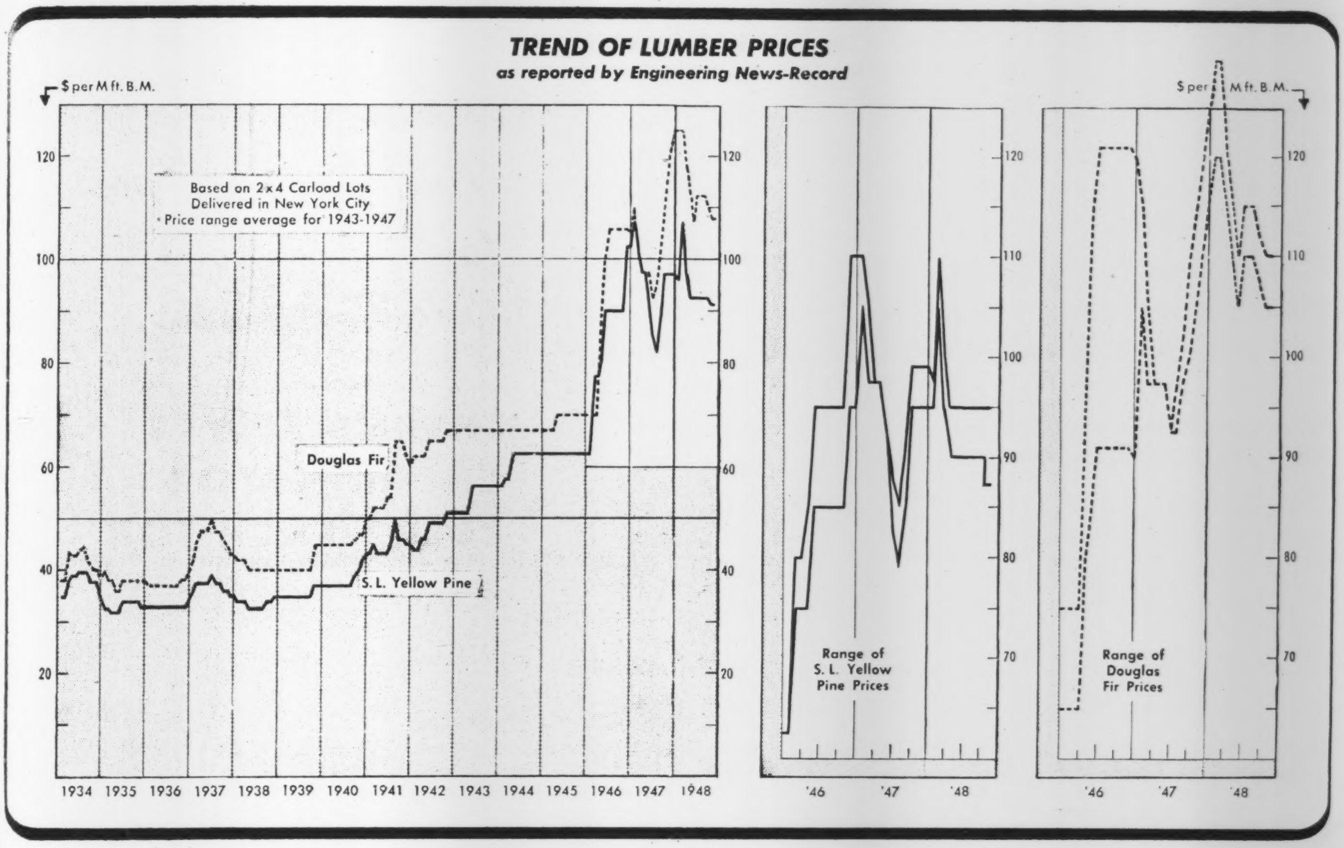
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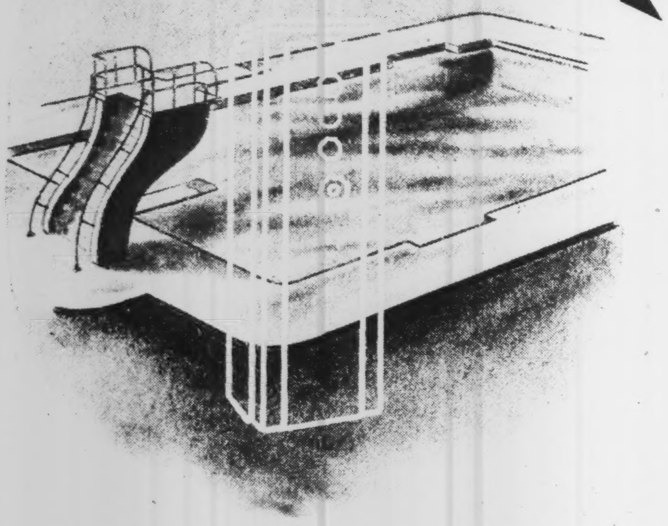


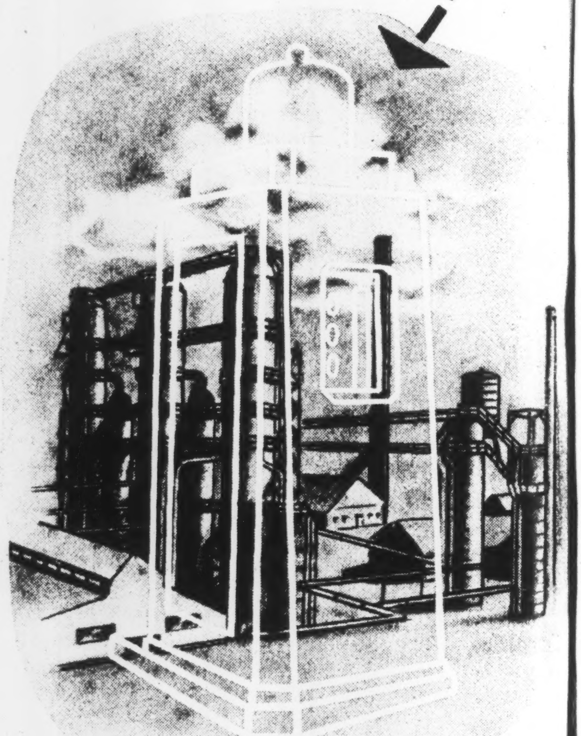
From Swimming Pools to Oil Refineries...

THERE'S A W&T CHLORINATOR TO FIT EACH JOB

Whether you need chlorination for killing pathogenic bacteria in water works, sewage plants and swimming pools — for slime control in oil refineries, power stations and paper mills — or for any of its many other uses in both public health and industrial fields, you can be sure that there's a W&T Chlorinator exactly right for each job.

Wallace & Tiernan Chlorinators are designed and built to meet the highest standards of precision manufacturing. There is no compromise with quality. That's one reason the famed Visible Vacuum Principle is known the world over. In addition, when you rely on chlorination by W&T, you can be sure of receiving an installation especially engineered, by a staff of experts on water treatment, to meet your job's particular needs. Each installation is handled as a specific project because W&T men know that rule-of-thumb methods won't give successful chlorination.

For your next installation, call your nearest W&T Representative and have him check your treatment requirements. There's no obligation and he will be glad to recommend a practical, workable solution to the problem that will leave both you *and* your client happy.



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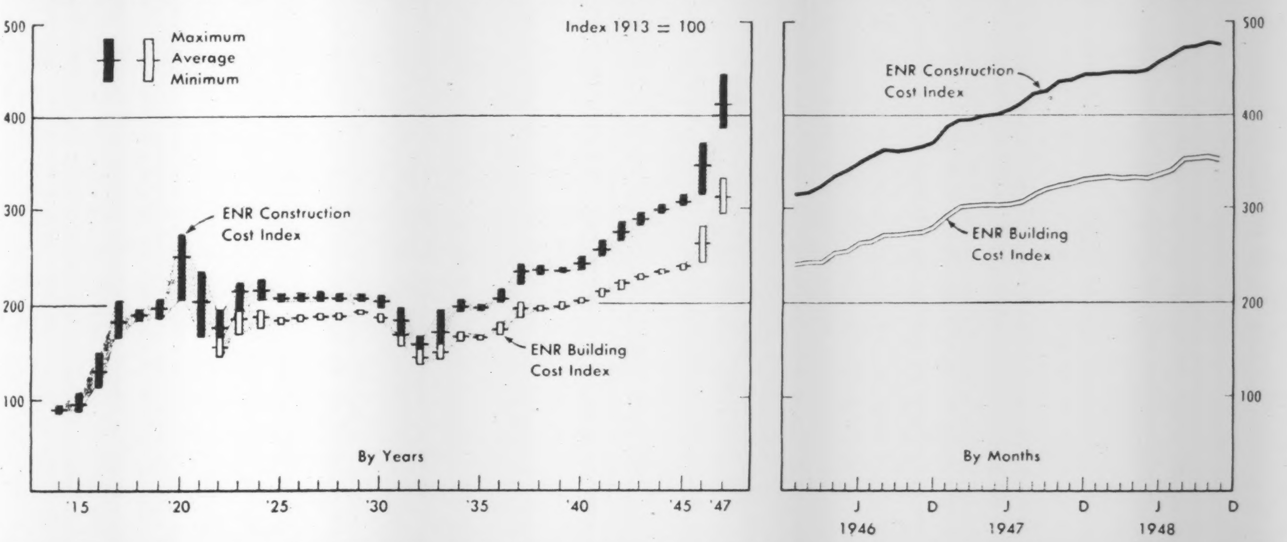
S-37

NOVEMBER CONSTRUCTION BUSINESS REPORT

ENGINEERING NEWS-RECORD CONSTRUCTION AND BUILDING COST INDEX TRENDS



ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

Thousands of Dollars (,000 omitted)	October 1947 (5 wk.)	October 1948 (4 wk.)	% Change*	Ten Months 1947 (44 wk.)	Ten Months 1948 (44 wk.)	% Change
Total U. S. Construction	$575,089	$648,434	+41	$4,681,491	$5,924,731	+27
Private Construction	350,736	347,593	+24	2,671,049	2,867,104	+7
Public Construction	224,353	300,841	+68	2,010,442	3,057,627	+52
Federal	30,763	67,878	+176	523,877	825,290	+58
E N R Construction Volume Index, 1913 = 100	228	291	+28	225	255	+13
Total New Productive Capital	$325,628	$336,014	+29	$2,844,599	$5,416,201	+90
Private Investment	325,628	336,014	+29	1,778,159	3,364,980	+89
Federal (non-federal work)	....	....	......	247,711	492,289	+99
Federal (federal work)	....	....	......	818,729	1,558,932	+90

* *Adjusted for difference in the number of weeks reported.*

CONSTRUCTION COST .... WAGE RATES .... MATERIAL PRICES

	November			Change October to November					
				1947			1948		
1913 = 100	1947	1948	% Change	Oct.	Nov.	%	Oct.	Nov.	%
E N R Constr. Cost Index†	436.91	478.25	+9.46	434.58	436.91	+0.54	480.21	478.25	−0.41
E N R Building Cost Index†	329.22	355.86	+8.09	327.29	329.22	+0.59	357.07	355.86	−0.34

† *Does not reflect increased costs due to overtime, lower labor efficiency, delivery delays, etc.*

ENR 20-CITIES' AVERAGE

Common Labor	$1.265	$1.413	+11.70	$1.263	$1.265	+0.16	$1.413	$1.413	0.0
Skilled Labor (Av. 3 Trades)	2.125	2.343	+10.26	2.125	2.125	0.0	2.332	2.343	+0.47
Bricklayers	2.271	2.554	+12.46	2.271	2.271	0.0	2.529	2.554	+0.99
Structural Ironworkers	2.139	2.322	+8.56	2.139	2.139	0.0	2.315	2.322	+0.30
Carpenters	1.963	2.177	+10.90	1.963	1.963	0.0	2.177	2.177	0.0
Cement, bulk, per barrel	2.65	2.95	+11.32	2.63	2.65	+0.76	2.95	2.95	0.0
Structural Steel, base	2.80	3.25	+16.07	2.80	2.80	0.0	3.25	3.25	0.0
Sand, per ton	1.829	2.042	+11.65	1.814	1.829	+0.83	2.042	2.042	0.0
Lumber, 2x4 Fir, per M ft	94.32	97.00	+2.84	92.62	94.32	+1.84	98.82	97.00	−1.84
Lumber, 2x4 Pine, per M ft.	85.66	83.33	−2.72	84.74	85.66	+1.09	84.68	83.33	−1.59
Common brick, per M	24.088	27.338	+13.49	23.713	24.088	+1.58	27.213	27.338	+0.46
Ready-mixed concrete, c.y	9.294	10.187	+9.61	9.261	9.294	+0.36	10.140	10.187	+0.46
Struct. clay tile, 3x12x12	119.96	127.94	+6.65	119.96	119.96	0.0	126.94	127.94	+0.79

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	October 1947	October 1948	% Change	Sept. 1948	% Change Sept. to Oct.
Steel (% operating Capacity) A.I.S.I., weekly average	96.3	98.5	+2.3	95.7	+2.9

	August 1947	August 1948	% Change	Eight Months 1947	Eight Months 1948	% Change
Cement, thous. bbl. U.S.B. of Mines	20,365	20,704	+1.7	118,347	133,215	+12.6

	September 1947	September 1948	% Change	Nine Months 1947	Nine Months 1948	% Change
Fabricated Structural Steel, tons, A.I.S.C.	164,345	158,841	−3.3	1,371,037	1,448,938	+5.7
Building Permits, 215 Cities, Dun & Bradstreet (,000 Omitted)	$307,560	$369,560	+20.2	$2,162,412	$3,051,464	+41.1

COST OF LIVING INDEX . . . . EMPLOYMENT

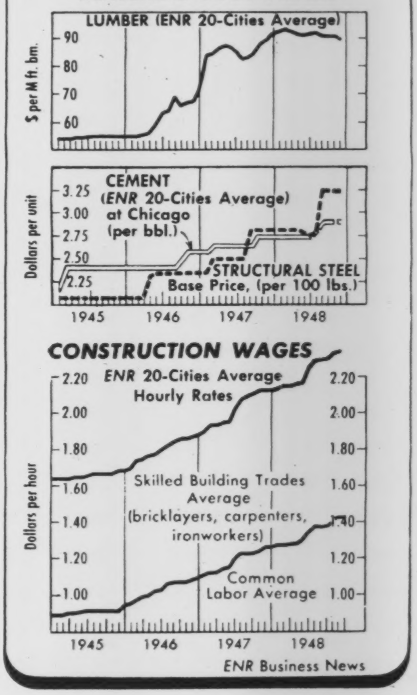
Base 1935-39 = 100	1941	September 1947	September 1948	% Change	August 1948	% Change Aug. to Sept.
Consumers' Price Index, B L S	105.2	163.8	174.5	+6.5	174.5	0.0
Rent (Housing) Index, B L S	106.2	113.6	118.5	+4.3	117.7	+0.7

	September 1947	September 1948	% Change	August 1948	% Change Aug. to Sept.
Contract Constr. Employ. (est.), thous., B L S	2,107	2,257	+7.1	2,257	0.0

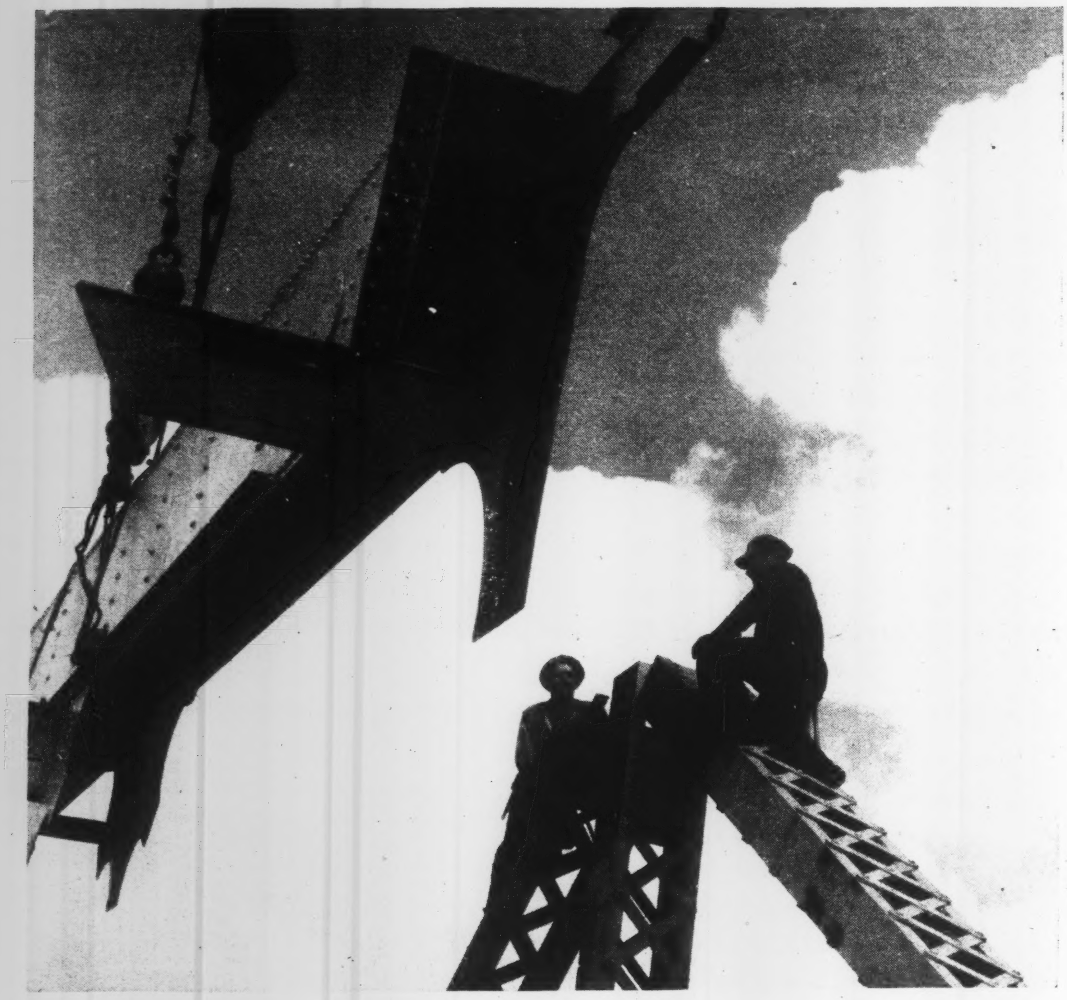
ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Nov., 1948	478.25	229.89	355.86	192.37	...	...
Oct., 1948	480.21	230.84	357.07	193.02	291	128
Sept. 1948	478.40	229.97	356.70	192.82	240	105
Aug., 1948	477.11	229.35	355.45	192.15	255	112
July, 1948	464.83	223.44	342.42	185.10	265	116
June, 1948	455.80	219.10	339.26	183.39	282	124
May, 1948	444.86	213.84	333.93	180.51	259	114
Apr., 1948	443.64	213.26	334.56	180.85	302	132
Mar., 1948	443.60	213.24	334.22	180.67	247	108
Feb., 1948	442.67	212.79	335.49	181.36	231	101
Jan., 1948	441.65	212.30	333.58	180.32	173	76
Dec., 1947	441.13	212.05	333.06	180.04	246	108
1947 (Av.)	413.16	198.61	312.96	169.18	228	100
1946 (Av.)	346.04	166.34	262.35	141.82	248	109
1945 (Av.)	307.75	147.93	239.14	129.27	123	54
1944 (Av.)	298.72	143.59	234.73	126.89	96	42

MATERIAL COST PRICES



ENR Business News



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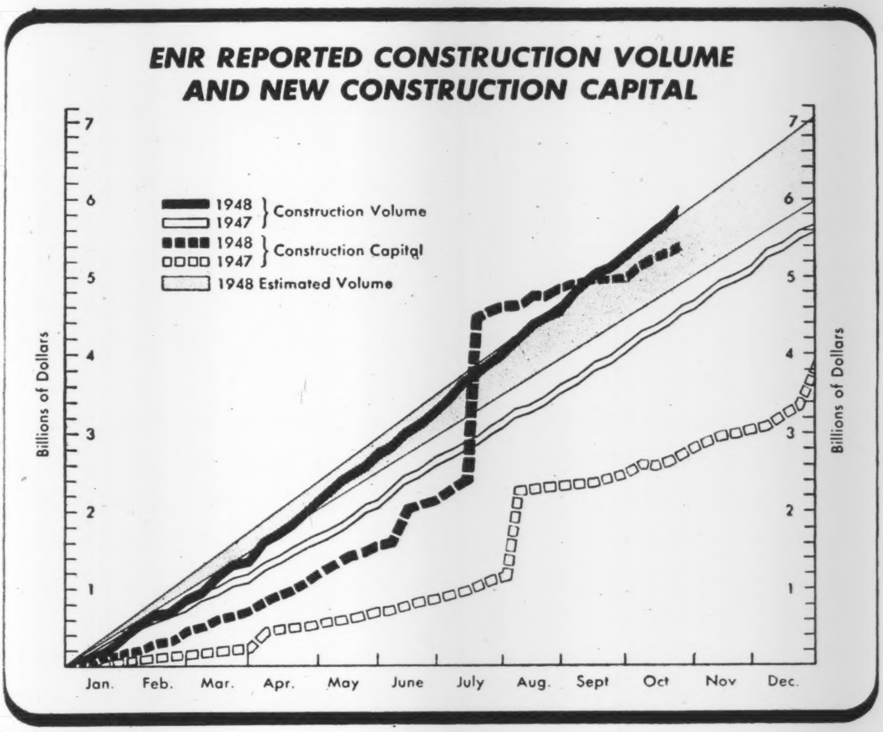
October Construction at Record High



More construction dollar commitments were made this October than in any previous October on record. Construction contracts were awarded at a weekly rate of $162,109,000, exceeded only in the seven-month period from March through September 1942. This was a period of peak wartime construction when the construction of public buildings averaged over $130 millions per week. Public buildings this year averaged $21,500,000.

October's record high volume was due to heavy industrial building awards. Contracts were awarded at a weekly rate of $52 millions, highest rate ever recorded by *Engineering News-Record.* A good portion of the October volume was accounted for by the $109 millions allotted by the Pacific Gas and Electric Company for three electric generating plants. in Moss Landing, Sandro and San Francisco, California.

As the result of the heavy industrial building volume in California, the Far West ran up a total of nearly $209 millions in contracts. This was approximately one-third of all the construction contracts awarded last month, and over double the $103 millions awarded for industrial building in September, a five-week month. Other sections of the United States which showed gains in the weekly rate of construction over September were the Middle Atlantic states. the South and the Mid West. West of the Mississippi declined over 25 percent and the New England states over 10.

New construction capital raised by private organizations and states and municipalities was well maintained in October, although below the midsummer peaks. Corporate security issues, to help finance construction, came to $224 million last month. Over $200 millions of this total was raised by public utilities, including $65 millions by the Pacific Gas and Electric Company.

States and municipalities raised approximately $110 millions in bonds for public construction. About half of this total went for public buildings, primarily schools and hospitals. The remainder of the total was spent for sewerage and waterworks projects, streets and road jobs and such miscellaneous projects as parks, airports and swimming pools.

ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD

Engineering News-Record *reports continental U.S. Construction projects of the following minimum costs-Waterworks, excavation, drainage and irrigation,* $ 28,000, *other public works* $ 50,000, *industrial buildings,* $ 68,000, *other buildings,* $ 250,000
Thousands of Dollars (000 Omitted)

	October, 1948							U.S. Cumulative Ten Months			
	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	Total U.S.	1948	1947	% Change '47 to '48	Canada Oct. '48
Public Work											
Waterworks	968	447	1,630	838	2,481	1,494	7,858	169,258	93,412	+ 81	1,345
Sewerage	1,082	2,856	1,230	11,658	5,589	2,420	24,835	193,991	115,724	+ 68	423
Bridges, public	738	4,670	2,411	2,713	3,851	2,470	16,853	234,898	160,863	+ 46	157
Earthwork and waterways	261	1,573	4,200	1,661	6,961	22,581	37,237	439,767	249,642	+ 76	1,549
Street and roads	7,092	17,684	14,222	7,310	17,338	8,199	71,845	872,390	685,039	+ 27	1,946
Buildings, public	7,683	45,818	14,722	11,014	24,442	19,687	123,366	949,464	494,912	+ 92	6,358
Unclassified, public	1,372	7,397	953	3,058	2,320	3,747	18,847	197,859	210,850	6	1,504
Total public	19,196	80,445	39,368	38,252	62,982	60,598	300,841	3,057,627	2,010,442	+ 52	13,282
Federal government (included in above classifications)	929	18,337	5,103	2,469	14,859	26,181	67,878	825,290	523,877	+ 58	-
Private											
Bridges, private	....	....	2,643	...	....	...	2,643	8,675	824	+953	
Industrial buildings	1,667	14,731	29,025	14,854	13,099	136,156	209,532	947,652	752,461	+ 26	22,342
Commerical buildings	6,430	48,468	10,144	15,458	25,260	11,520	117,280	1,564,840	1,559,397	+ 0.3	6,001
Unclassified, private	....	....	9,300	940	7,279	619	18,138	345,937	358,367	- 3	10,400
Total private	8,097	63,199	51,112	31,252	45,638	148,295	347,593	2,867,104	2,671,049	+ 7	38,743
Total Engineering Construction											
Oct., 1948 4 weeks	27,293	143,644	90,480	69,504	108,620	208,893	648,434	....	....	......	52,025
Sept., 1948 5 weeks	41,297	161,615	98,073	76,541	185,536	102,355	665,417	....	....	......	69,875
Oct., 1947 5 weeks	18,983	175,960	92,755	72,746	148,720	65,925	575,089	....	....	......	44,374
Ten months 1948	278,820	1,577,632	909,121	714,735	1,493,743	950,680	....	5,924,731	....	+ 27	429,229
Ten months 1947	178,996	1,228,955	797,575	632,722	1,119,648	723,595	....	....	4,681,491	......	382,222
% Change '47 to '48	+56	+ 28	+ 14	+ 13	+ 33	+ 31	....	....	....	......	+ 12

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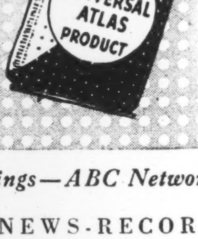

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ENGINEERING NEWS-RECORD

NOVEMBER 11, 1948 VOL. 141 NO. 20

Election result seen signal for new power, housing acts

Observers assay effect of national vote on federal construction programs—Taft-Hartley Law features likely to be retained—Price investigations seen continuing

By Vincent B. Smith

Last week's elections set up an executive-legislative team that early in 1949 will reverse some of the hotly contested decisions of the 80th Congress. The changes, both in laws and in approach to current questions, will be significant for all U. S. business. For civil engineering-construction they will be particularly important in the fields of public power, public housing, labor and delivered pricing.

In all these respects, the new Congress can be expected to take a line in accord with the views of President Truman. His campaign speeches, pounding away on the same themes as his messages to the 80th Congress, have made his position clear on the following issues.

Power—TVA will get its steam plant at New Johnsonville, Tenn. That single prediction epitomizes the attitude of the new Congress on public power.

The private utility-public agency battle over power projects has been decided in favor of the federal government. For the next two years, at least, Congress will evaluate proposed projects with first emphasis on the engineering-economic aspects and with secondary consideration of the private-public power battle.

Housing—The election was a severe setback for the private housing and real estate groups that have opposed use of federal funds to subsidize low-rent housing and redevelop urban slum areas. The 81st Congress during its first session will undertake to enact public housing and slum clearance legislation similar to those sections of the Taft-Ellender-Wagner bill that were omitted from the National Housing Act of 1948.

Labor—Not all features of the Taft-Hartley Law will be sacrificed. Union elections will go out the window. They are on the way out already. In the construction industry particularly, they have been beset with almost insurmountable difficulties.

Some prohibitions probably will be retained against jurisdictional strikes and secondary boycotts. The President has called jurisdictional strikes "indefensible". He told the 80th Congress that jurisdictional disputes should be settled by arbitration rather than by the National Labor Relations Board. The procedure now in use by the contractor groups and AFL unions in construction relies on arbitration, with recourse to NLRB only as a last resort.

President Truman likewise has repeatedly condemned secondary boycotts for unjustified purposes, such as to further a jurisdictional strike or force an employer to violate the National Labor Relations Act. But, he has declared some secondary boycotts justified —for example, those invoked to protect wage rates and working conditions. Presumably the ban on secondary boycotts will be hedged with some sort of a limitation.

Delivered pricing—Senate investigation of price systems, deriving from the famous Supreme Court decision in the cement case, is bound to undergo change. The Capehart subcommittee is certain to hold its scheduled hearings and continue its study up to at least the first of the year. It may speed up its operations to turn in a report about that time.

Should the subcommittee be continued, Chairman Capehart would be replaced by a Democrat. Under Democratic control a Capehart report at the first of the year could be pigeonholed by the full Interstate and Foreign Commerce Committee. As other possibilities, the investigation could then be started afresh or could be enlarged to inquire into the problems of monopoly and economic concentration as called for in the second part of the original Senate resolution, added to it through the efforts of Senator O'Mahoney, who will be in a

(Continued on p. 76)

Navy tests flexible airport pavements

Flexible airport pavements again have demonstrated their adaptability to stage construction, according to a recent nation-wide survey of 58 war-built fields by the Navy's Bureau of Yards and Docks. Bureau technologists point out that the test results reinforce past experience in showing that these pavements increase in bearing capacity under traffic.

The few exceptions were found in those fields where the groundwater table is within 2 ft. or less of the pavement. In these places, capillary action of the subgrade soil apparently maintains the moisture content of the material and counteracts any effect of traffic toward increased compaction. For all other air stations, however, the subgrades now have bearing capacity greater than when constructed.

This fact indicates that any future strengthening of the runways and taxiways—to carry loads even heavier than those permissible under the increased capacities already attained—can be most economically accomplished by building up the existing pavements. This method would be faster and far less expensive than tearing out and replacing the present pavements, with attendant loss of the increased compaction that traffic use has added to the subgrade.

Generally, the tests bear out the judgment based on prior experience that bearing capacity of bituminous pavements increases under traffic, provided the pavements were not overloaded beyond their designed capacity at the start. The bureau's evaluation program showed wartime flexible pavements of moderate thickness, ranging generally from 6 to 12 in., with a few of greater thickness up to 16 in., to be capable of taking individual wheel loads from 5,000 to 60,000 lb. without visible distress. By conventional design standards, these pavements would have to be 15 to 45 in. thick.

NEWS BRIEFS

Industrial Construction — Ground has been broken for the 25-story home office building of The Mutual Life Insurance Co. of *New York*, on the east side of Broadway between 55th and 56th Streets. Turner Construction Co. is builder, and Shreve, Lamb and Harmon Associates, architects . . . Associated Industries of *Massachusetts* will spend more than $115 million on new plant construction in the near future . . . A $2,500,000 construction job has been started by the Chesapeake & Ohio Ry. It is a 17-mile spur track from *Carver, Ky.*, into *Breathitt County* . . . Construction expenditures for the next four years have been estimated at $100 million by the *Pennsylvania* Power & Light Co. . . . E. I. du Pont de Nemours and Co., Inc., will build a multi-million dollar plant to make "Orlon" acrylic fiber near *Camden, S. C.* . . . Federal Power Commission has authorized the Northern Natural Gas Co. of *Omaha, Neb.*, to build $4,311,000 of facilities to increase deliveries of natural gas from Clifton, Kan., to Minneapolis-St. Paul district.

Public Construction—A $1,439,100 contract for hydraulic fill on the site of the U. S. Naval Air Missile Test Center at *Point Mugu, Calif.*, has been awarded to the Standard Dredging Corp. of Los Angeles and San Francisco Bridge Company . . . J. E. Starrock, manager of the Water Conservation Assn. of Texas is urging a $100 million state bond issue to finance conservation projects . . . Service Const. Co. submitted a low bid of $2,749,996 for general construction work for the 250-bed psychiatric hospital at the University Medical Center, *Indianapolis, Ind.* . . . S. J. Aroroso Const. Co. was low bidder at $1,007,000 for the California Division of Highways building at *San Francisco* . . . Work is expected to start early next year on a $3,000,000 medical school building of the University of Oklahoma in *Oklahoma City* . . . At a cost of $3,000,000, Harvard University, *Cambridge, Mass.*, will erect Commons Hall and graduate school dormitories in strictly new design . . . Trustees of the University of Illinois, *Urbana*, will ask the state's general assembly for $63,000,000 for new buildings in the 1949-1951 biennium . . . Preliminary federal approval has been given for a $1,200,000 enlargement of the Children's Hospital at *Louisville, Ky.*

Highways—A *Kentucky* report shows that about $825,000 of the annual $9,000,000 allotment for state highway maintenance is used to provide safety for highway users . . . *Colorado* will have a state highway program of more than $18,000,000 for the next three years . . . *Connecticut* State Highway Department is organizing an Engineering Construction Battalion to be part of the Army Reserve Forces. The department will have $8,000,000 for construction in 1949 . . . More than 200 miles of old and new highways in *British Columbia* have been hard-surfaced during the current season . . . The *Virginia* State Highway Department has established a special traffic engineering department to assist municipalities in their problems.

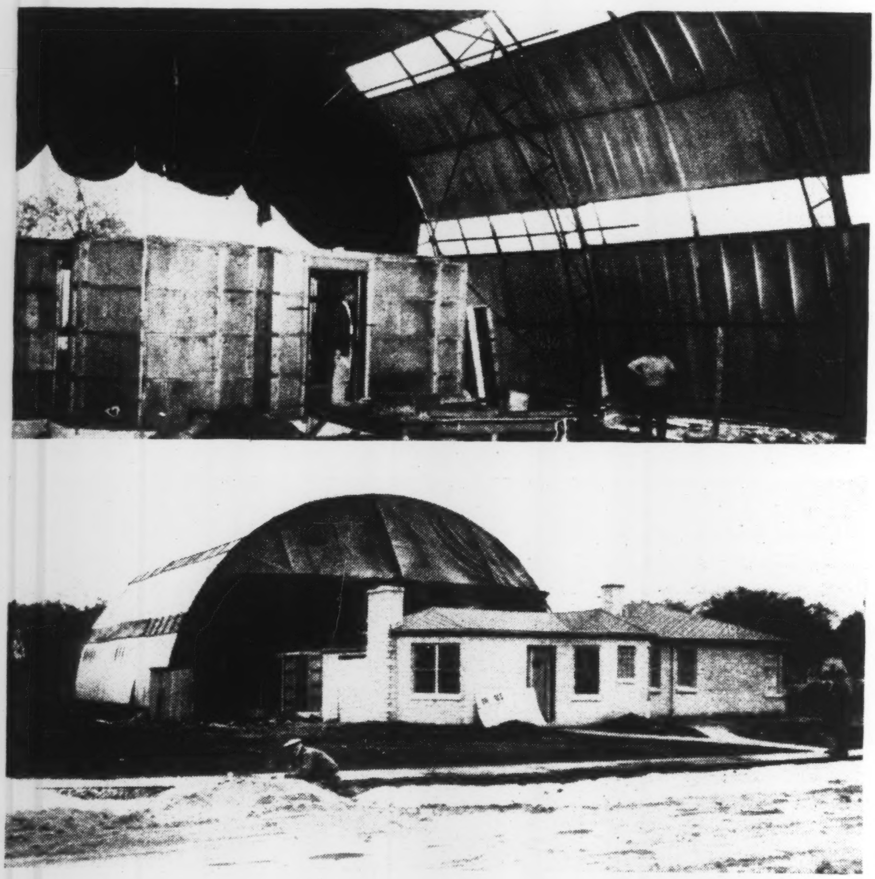
Labor—An 11-day strike of 1,200 union carpenters at *Fort Worth, Tex.*, has been settled with a wage increase of 12½ cents an hour . . . Nearly 100 representatives of bargaining groups of contractors associations in the Builders Exchange and executive committee members of AFL building trades unions in *Rochester, N. Y.*, voted their unanimous confidence in the work of the local labor-management committee in the four years since its organization . . . Wage increases averaging 12¢ an hour have become effective in the Halifax, N. S., district.

◆

New engineering post goes begging in Conn.

Connecticut's state personnel director, Glendon A. Scoboria, has had difficulty in finding a man to qualify for the newly established position of supervisor of construction in the comptroller's office. The first ten men who applied for the position, which will pay from $7,560 to $9,000 a year, were disqualified.

Responsible for the supervision of a $15,000,000 building program, the supervisor of construction must have had 14 years responsible employment in design, construction and related administration, of which six years must be of planning and design and include experience on major construction projects. Holders of engineering or architectural degrees are required to have only ten years experience of the above type. Out of state applicants will be considered.



UNDER COVER HOUSE CONSTRUCTION—This mobile canopy of steel and glass can be towed from house to house in production-line building, so that work can continue despite bad weather. Actually a home-building hangar, the canopy was devised by contractor Caesar Marconi and has been used in Chicago's Franklin Park development. The shelter, 100 ft. long and 60 ft. wide, is mounted on eight steel wheels. (Wide World Photo)

Propose uniform membership grades for members of engineering societies

Engineers Council for Professional Development takes first step in long-discussed move toward greater uniformity in membership requirements of engineering groups

Adoption of uniform requirements for membership in the major engineering societies of this country will be proposed to those societies in the near future. The proposal is the result of action at the 16th annual meeting of the Engineers Council for Professional Development held in Detroit, Oct. 29-30. At that meeting the council approved a report on uniform grades prepared by its Committee on Professional Recognition and voted to send the report to the societies that sponsor ECPD with an invitation to a conference to be held early next year to consider the ECPD proposals.

The present wide divergence in the requirements for admission to corresponding grades of membership in the societies representing civil, mechanical, electrical, mining and chemical engineers has been the subject of criticism for many years. In recent years the ASCE has been considering simplifying its grading of members, but early this year decided to withhold action pending the outcome of the action now taken by ECPD.

Fewer grades favored

The ECPD committee, which is headed by Ole Singstad, New York consulting engineer, recommends that only three grades be set up as essential—member, associate member and student. For societies that wish to establish or continue other grades, it recommends the grades of fellow and affiliate.

Requirements for admission to member grade are set close to those set up for registration as a professional engineer in the model registration law. They are, graduation from an accredited engineering curriculum plus four years of experience, of which two shall have been in responsible charge of engineering work. For non-graduates, ten years of practice satisfactory to the governing board of the society concerned is specified. A license to practice engineering would be taken as satisfactory evidence of having the requirements for this grade. Admission by written examination also would be possible.

The grade of associate member proposed would correspond to that of junior in the American Society of Civil Engineers.

These two grades correspond closely to the two principal grades recently proposed for the ASCE by its Committee on Membership Grades.

The optional grade of fellow proposed by the ECPD committee would be "an honorary status to which an engineer of distinction is called, but for which he cannot apply."

Engineering school accrediting

H. T. Heald, chairman of the Committee on Engineering Schools, reported that the work of re-examining engineering school curricula accredited before the war and of examining new curricula has been carried forward actively during the year. Regional committees visited 39 schools where 125 curricula were re-inspected and 43 were inspected for the first time. Fifty school visits are planned for the coming year, and it is hoped to complete the current program in 1950. A total of 273 men have volunteered their services for these examinations, of whom 25 percent are from outside the teaching field.

Fees for examinations at engineering schools have had to be increased to $150 for the first curricula examined and $100 for each additional one.

Similar examinations looking toward accrediting technical institute courses are now being made by a subcommittee headed by H. P. Hammond.

Another subcommittee is now studying the possibilities of accrediting graduate courses in engineering.

Testing of students

Supervision of the testing of students taking the pre-engineering inventory and the engineering achievement tests, which since its inauguration has been handled by the Carnegie Foundation for the Advancement of Teaching in cooperation with ECPD and the American Society for Engineering Education, now has been taken over by the Educational Testing Service at Princeton University under the sponsorship of ECPD. Under this agreement the ETS will endeavor to improve the current tests and add new tests where that appears desirable.

James W. Parker, president, Detroit Edison Co., and Harry S. Rogers, president of the Polytechnic Institute of Brooklyn, were reelected chairman and vice-chairman, and S. L. Tyler was elected secretary for the coming year.

Architects start study of atom effect on cities

The American Institute of Architects said last week that a new committee is now examining the military and peacetime effects of atomic energy in relation to city planning and construction of buildings.

The committee will attempt to determine whether buildings can be designed to withstand the blast of atomic bombs or the deadly radiation that might result from conversion of atomic power to industrial use. Four main problems will be attacked: The design of buildings to shield inhabitants from all radiation; the proper geographic dispersal of industrial buildings concerned with atomic energy and power; the provision of facilities in building designs for disposal of atomic wastes, and investigation of the safety, design and environment of buildings and cities that may be called upon to withstand effects of atomic-age war.

Chairman of the committee is James R. Edmunds, Jr., of Baltimore, Md. Mr. Edmunds, a former president of the American Institute of Architects, is at present chairman of the Construction Industry Advisory Council and co-chairman of the National Joint Cooperative Committee of the A.I.A. and the Associated General Contractors.

Joint group hears CAA discuss prequalification

Meeting at Boston last month, the joint cooperative committee of the National Association of State Aviation Officials and the Associated General Contractors of America discussed further the prequalification of bidders—a topic of interest at its Seattle meeting last July.

Since the July meeting, Richard T. Puckey of the Civil Aeronautics Administration's Seattle office has issued instructions in which the statement of financial resources, dated within 30 days of bid opening is called an illogical and difficult requirement. Instead of this provision Mr. Puckey's office has required the financial statement "as of December 31, of the year preceding the date for the call for bids, or as of the end of the fiscal year on which he operates."

This modification in the prequalification of bidders also permits the contractor's financial statement to remain effective for 15 months. This allows a three-month period of grace at the start of each new year in which to prepare a new statement.

CAA representatives at the Boston meeting assured the committee that other CAA offices would be instructed to take similar action.

California AWWA adopts water code

Minimum standards for waterworks systems were adopted by the California Section of the American Water Works Association at its recent conference in Riverside, Calif. These standards were prepared for possible inclusion by reference in the California Health and Safety Code where they would govern additions to water-supply systems.

If adopted by the legislature, the standards will take the place of a brief temporary statement agreed on as an expedient in 1947.

Bearing the title "Standards of Minimum Requirements for Safe Practice in the Production and Delivery of Water for Domestic Use," the standards cover water systems from all standpoints. Sections pertain to quality of water, design, distribution systems, training of personnel and maintenance. The meeting at which these standards were adopted had a registration of 1,150.

Flocculation research

Highlight of the technical program was a paper prepared by Prof. W. F. Langlier, University of California, and Harvey F. Ludwig, consulting engineer, Pasadena, Calif. Bearing the title "The Mechanism of Flocculation as Applied to the Clarification of Turbid Waters," this paper summarized a research program to determine the how and why of flocculation. Langlier and Ludwig conducted the study by preparing synthetic turbid waters from soils of known properties. The studies indicated that cation-exchange properties of turbidity particles is one of the main controlling factors in flocculation.

In a paper on the use of quaternary compounds as algacides and bactericides, H. F. Eich, public health engineer, Los Angeles Bureau of Sanitation, pointed out that the compounds must be used with caution because the properties of these compounds vary so greatly. Much additional research is necessary, he pointed out, before use in public-water supplies. Pending exact determination of toxicity and better manufacturing methods to reduce costs, the quaternaries should be restricted to use as bactericides in dish washing, and possibly as algacides in swimming pools.

Included among the authors of other papers were H. A. Mylander, De Laval Steam Turbine Co.; Franklin Thomas, ASCE president-elect; Frank M. Stead, California State Health Department; G. E. Arnold, director of the San Diego Water Department, and others.

Manufacturers' exhibits

A large display of manufacturers' equipment was shown. One highlight was a previously unexhibited rotary cylinder valve manufactured by the Inter-American Engineering Corp. of Los Angeles. This valve uses monel metal for seats but other interior parts are lined with plastic. The plastic coating provides protection from sticking, corrosion and general metallic contamination.

Another exhibit attracting much attention was the Wallace & Tiernan booth with an electromatric-type, chlorine-residual recorder. Also exhibited was a centrifugal converter operating a vacuum chlorinator. The converter is activated by a Sparling flow meter so that chlorine is applied in exact proportion to pipeline flow.

New officers are: Chairman—L. W. Grayson, director of water and power, Riverside, Calif.; vice-chairman—E. A. Reinke, chief sanitary engineer, State Department of Public Health; and secretary-treasurer—H. C. Medberry, San Francisco Water Department.

L. J. Alexander, chief engineer, Southern California Water Company, was given the Fuller Award in recognition of his work as chairman of the standards committee.

◆

S. Johannesson retires, designed Pulaski Skyway

Sigvald Johnannesson, 71, for 24 years engineer of design for the New Jersey State Highway Department, has retired and will go to California to reside. His outstanding accomplishment was the designing of the famous Pulaski Skyway which carries traffic over streets and railroad tracks in Jersey City from the Holland Tunnel plaza to Elizabeth.

He is also notable for having evolved the compressed air method of moving huge blocks of cement pavement sideways in the widening of Route 26, the New Brunswick Pike from Trenton to Penn's Neck, thus avoiding complete reconstruction of the highway. That method is now generally employed throughout the construction field.

Mr. Johannesson is a native of Denmark and a graduate of the University of Copenhagen. He went first to London where he worked on deep level tunnels and municipal improvements. He came to the United States to work with the engineering firm which designed the Pennsylvania Railroad tunnel under the Hudson River, and later he was engineering assistant to the chairman of the board of engineers for the railroad.

MAJOR MEETINGS

National Association of Housing Officials, annual meeting Hotel Statler, Boston, Mass., Nov. 13-16.

National Reclamation Association, Oklahoma City, Okla., Nov. 17-19.

Black Top Roads Association, Springfield, Ill., Dec. 2.

Society for Experimental Stress Analysis, annual meeting, Hotel Commodore, New York City, Dec. 2-4.

Highway Research Board, National Academy of Sciences and National Research Council, 2101 Constitution Ave., Washington, D. C., Dec. 7-10.

National Society of Professional Engineers, annual meeting, Sherman Hotel, Chicago, Ill., Dec. 15-18.

Taxpayers' suit calls N. J. bridge deal a fraud

A taxpayers' suit has been filed in Burlington County, N. J., asking the State Superior Court to declare unconstitutional and void the recent transaction in which the county bought two Delaware River bridges.

Paying $12,000,000, the county acquired the Tacony-Palmyra and Burlington-Bristol bridges from the Burlington-Bristol Bridge Co. The unforeseen sale came as the Delaware River Joint Bridge Commission had received a report from Knappen Engineering Co. of New York, which set the value of the two structures at $4,900,000. Both bridges are nearing the 20-year age at which the state can purchase them under provisions of the New Jersey Bridge Act of 1925.

The taxpayers' suit charges fraud in the $12,000,000 deal for the structures and asks the court to enjoin the defendents, including all members of the County Board of Freeholders as well as the former owners, from carrying out the purchase. A temporary restraining order against completing any unfinished parts of the transaction has been issued.

Attorneys for the parties to the deal call the taxpayers' suit "a joke" and ask how they can restrain something already accomplished.

◆

New safety rules require $10 million improvements

An estimated 17,000 buildings in the District of Columbia come under the recent regulations of the district commissioners requiring inclosed fire-resistant stairwells and other safety features in existing structures occupied or used by human beings. Cost of the extensive program of safety improvements is not known, but the lowest estimate received on the improvements so far is $10,000,000.

New Jersey ok's toll road construction

Legislation authorizing the construction of toll highways in New Jersey became law late in October, as noted briefly in last week's issue. However, whether any toll road actually will be built and where it will be located is not as definite as the first reports from Trenton indicated.

No work will start until the turnpike authority, which is yet to be appointed, is assured that a toll road on a particular route is financially practical and until the route has received legislative approval.

Turnpike authority powers

The new act authorizes the appointment of a three-man New Jersey Turnpike Authority within the State Highway Department with powers to plan, finance, build and operate toll roads (*ENR* Nov. 4, p. 12). Bonds issued are payable solely from tolls and other revenues from the highway; the taxing power of the state is not pledged for their support. When the bonds issued to build any turnpike have been paid off, the turnpike becomes toll free and is to be turned over to the State Highway Department. However, the turnpike authority is authorized to continue to collect tolls on one turnpike to pay bond interest on another.

No oil company can be granted exclusive rights to sell gasoline and oil along the turnpike; there must be competition.

Traffic studies, surveys and design work can be started by the authority as soon as it is organized, as the State Highway Department is authorized to advance funds for that purpose, to be repaid from bond sales. Consultants can be hired for this work.

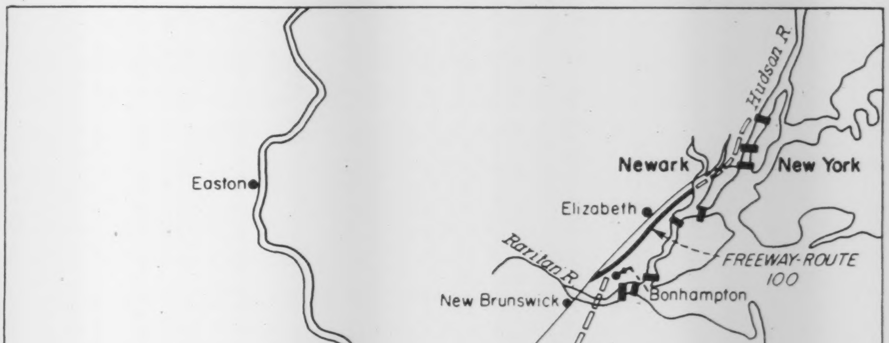
No definite plans

Charles M. Noble, state highway engineer, says that any decision on the question of employing outside consultants must wait on the appointment of the turnpike authority. Similarly, a decision as to what route is selected for the first turnpike will be up to the authority. Mr. Noble says that the general route laid down for the freeway known as Route 300, shown in the accompanying map, is the most discussed possibility, but before actual work can start on it, the turnpike authority must determine its economic feasibility and obtain legislative authority to proceed with the construction.

As to the cost of the proposed turnpike, Mr. Noble says that no realistic estimates have been made, but it is assumed that the cost will be between $85 million and $100 million.

If built along the route of the projected freeway, the new turnpike would start near Deepwater, N. J., at the New Jersey end of the new bridge over the Delaware River being built by the Delaware Highway Department and would extend north through the state to a connection with the new freeway known as Route 100 (*ENR* Jan. 23, 1947, Vol. p. 120) at a point near Bonhampton, a distance of about 90 miles. Mr. Noble says that, although the State Highway Department has legislative authority to build Route 100 south across the Raritan to a connection with U. S. No. 1, it appears probable now that a connection to U. S. 1 will be made north of the Raritan. In that case, the new turnpike would be carried across the Raritan to a connection with Route 100 in the vicinity of Bonhampton.

A toll highway on this location would have the advantage for motorists or truckers bound for Washington and points south of by-passing the congestion in and around Trenton, Camden and Philadelphia. It lies parallel to one of the few routes that was asserted to be economically feasible for a toll highway in the report to Congress entitled "Toll Roads and Free Roads" prepared by the Public Roads Administration in 1939.



POSSIBLE ROUTE FOR TOLL HIGHWAY—The route originally selected for one of New Jersey's projected "freeways" is now being advanced as the possible route for one of the toll highways recently authorized by the state legislature.

NEW WELDING PROCESS SHOWN

A gas-shielded, metal-arc method of welding aluminum, particularly adaptable to welding structural alloy 61S-T, was demonstrated at the National Metal Show at Philadelphia late last month by Air Reduction Sales Co.

Welding is accomplished by feeding a consumable wire through a pistol-shaped welding "gun". This simple hand welding unit, now in production, will be generally available by the end of the year.

Heavy sections of aluminum and aluminum alloys may be welded at wire feed speed of from 100 to 300 in. per minute.

Assay election effect on construction

(*Continued from p.* 71)

position of influence as the new chairman of the Congressional Joint Committee on the Economic Report.

Federal spending—The crux of the problem on the size of the federal budget lies in two related questions: funds for national defense and expenditures for military aid to ERP countries and to China. President Truman has set a limit of $14.4 billion for national defense in fiscal 1950, only $600 million above the current figure.

Military aid to foreign nations and a bigger defense budget have been looming ever larger in discussions of recent weeks. Washington opinion now leans to the view that it may add $3 billion to $6 billion to the next budget. The money increase may be balanced in some measure by a possible reduction in requirements for non-military aid administered by ECA. Even so, the addition would throw the budget out of balance and would exert a further draft on scarce metals.

Taxes—Added income would be needed to avoid a deficit and perhaps to retire a part of the national debt. The new Congress might move to restore some of the former rates on individual incomes, and it could easily turn to higher rates on business earnings.

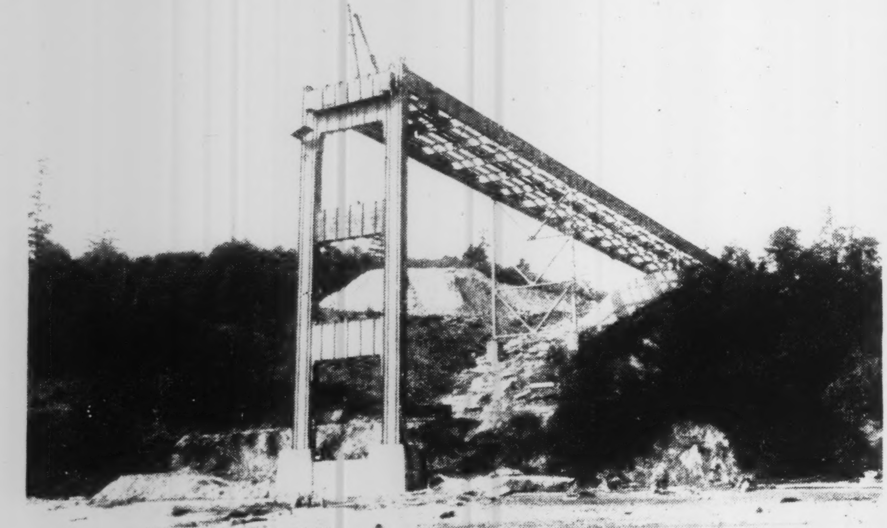
Materials allocations—National defense at home and military lend-lease abroad are not going to improve the availability of scarce materials in 1949. Conflicting opinions are offered as to the likelihood of government controls on steel, copper and aluminum next year.

The Draft Act gives the President power to order priority on deliveries to military contractors. This latent authority, some observers contend, is sufficient to assure that producers will voluntarily make first delivery to firms working on military contracts, thus avoiding imposition of government priorities.

On the other side are some big customers who ask for government allocations, primarily to assure their getting what they need. A few even suggest allocations for their own products to relieve them of the onus of trying to distribute inadequate supplies among their own unhappy customers.

Voluntary industry allocation agreements have not worked out to the full satisfaction of the producers. The steel companies, with the exception of U. S. Steel, are not happy about the agreements they have entered into, and they have planned to drop them Feb. 28, when the law expires, even though existing agreements can be extended six months beyond that date.

Construction volume—Because of the expected increase in military expenditures, President Truman may call for deferment of postponable civil works as a means of shaving federal outgo. This possibility does not balance too well with the liberalized program advocated by him and the Congressmen who will take control in January, but it may prove more desirable than an increase in government income through taxes.



REBRIDGING TACOMA NARROWS—The west approach to the new four-lane highway suspension span takes shape as gin pole and jinniwink hoist members into place. About 16,000 tons of steel, fabricated by Bethlehem Steel Corp., will be used in the structure.

Any such curtailment of federal or federal-aid projects would not in the next twelve to 18 months reduce the total construction volume of the nation. The effect would be more probably to release men and materials for other types of projects.

Private building—In the immediate offing, there is no prospect that private building will decline. Apparently it will continue to use all the manpower and materials it can get. After the first sharp shock of the surprise election, businessmen have realized that they will continue to operate under the same kind of government that has been in control for 16 years, with only the partial offset of the last Congress to vary the continuity.

Some re-appraisal undoubtedly is being made of contemplated new ventures. But capital expenditures needed to supply the existing market with the things it wants will go ahead without much change.

Government reorganization—Election results indicate considerably less public dissatisfaction with the sprawling organization of the federal government than had been expected. For that reason, the recommendations to be presented to Congress Jan. 13 by the Commission on Reorganization of the Executive Departments (the Hoover commission) may receive less urgent attention and produce fewer changes.

Creation of the commission by unanimous consent of both houses of Congress in 1947 and equal distribution of Democrats and Republicans among the twelve members apparently assure non-partisan acceptance of its recommendations. Beyond that, however, the party in power is likely to resist disruption of a federal organization that it has in good part created and staffed with people of its own choosing—particularly after the voters have expressed satisfaction.

River development—Individual members of the new Congress can be relied upon to introduce and press bills for regional authorities—almost certainly for the Missouri and Columbia river basins, but there is no reason to estimate that Congressional sentiment for these measures will be any stronger than it has been in the past. In river development, the main objective of the 81st Congress will be faster construction of projects by existing federal agencies for reclamation, flood control, power and navigation.

OBITUARY

Charles W. Staniford, 87, former harbor engineer, died at Newark, N. J., Oct. 30. For a period of 15 years he had served as chief engineer of the N. Y. City Department of Docks and Ferries. After the San Francisco earthquake and fire in 1906, Mr. Staniford was called upon to design the piers and sheds to be rebuilt there. He had also planned and designed the piers, sheds and terminal facilities at Camden, N. J., Portland, Ore., Tampa, Fla., and Quebec, Canada. A civil engineer graduate of N. Y. University, 1881, he was one of the oldest alumni. Only six months ago he retired as consulting engineer of the New Jersey Harbor commission after 15 years.

Harry John Hassler, 63, a civil engineer for the Arthur G. McKee Co., Cleveland, Ohio, for the past 16 years died Oct. 29 in that city. He was a graduate of Carnegie Institute of Technology.

Louis F. Schirmer, 56, engineer for the city water department at Galveston, Tex., died there on Oct. 21.

Royal D. Salisbury, 68, a Denver, Colo., civil engineer, who went to Tulsa, Okla., in 1918, to plan dam projects for northeastern Oklahoma, died in Grand Prairie, Tex., on Oct. 21. His plans developed into the Grand River Dam Authority and led to the construction of Pensacola Dam.

Lt. Col. Marshall Joseph Noyes, 65, retired Army officer and former assistant professor of military science at the University of Kentucky, died at Fort Knox, Ky., Oct. 26. For three years he had been an engineer with the Kentucky State Highway Department. He resigned that post recently.

Thor A. Rydingsvard, 43, resident engineer at the Corps of Engineers Wolf Creek Dam project, died at Somerset, Ky., Oct. 28, as the result of a gas explosion in his home.

Dewitt Harmon, 83, of Kernersville, N. C., retired civil engineer, died Oct. 29. He formerly served as civil engineer with a railroad at Bethlehem, Pa., and for a time was assistant to the engineer in charge of the maintenance department of the Richmond and Danville Railroad. He later located at Asheville, N. C., as a civil engineer and then became connected with the Department of Engineering of Georgia. He served on the Forsyth County, N. C., highway board from 1912 to 1926, surveying and directing construction of roads.

Frederick C. Herrmann, 78, Berkeley, Calif., consulting engineer, died Oct. 27. Before entering private practice in 1914, he had served successively with the San Francisco city engineer office, as irrigation and drainage engineer in the Rocky Mountain area, and as chief engineer for the Imperial Valley Irrigation District and the Spring Valley Water Co. He had an important part in closing the break in the Colorado River in 1905-06 that was rapidly filling the basin now partly occupied by Salton Sea. A graduate of the University of California, he was a consultant on appraisal of all properties acquired for the Central Valley Project.

Edgar Bridge, who was resident engineer during the building of the Gandy Bridge at Tampa, Fla., died at West Palm Beach, Fla., Oct. 21.

Bernard W. Orvis, 62, former acting city engineer of Kansas City, Kan., who had been employed in the city engineering department for 39 years, died Oct. 22.

John T. McCrosson, 92, veteran Hawaii engineer, died Sept. 30 at the home of his daughter in Arlington, Va. He earned the title of Hawaii's "water king" because of the many irrigation projects he developed throughout the islands.

Harry A. Willis, a civil engineer who served nearly 40 years with the New York State Division of Highways, died Oct. 21 in Troy, N. Y. Mr. Willis joined the State Department of Public Works after his graduation in 1909 from Rensselaer Polytechnic Institute. At the time of his retirement last year, he was county assistant in the highway division covering both Albany and Rensselaer counties.

Wayne W. Wyckoff, 47, of Glendale, Calif., engineer in charge of the Los Angeles Aqueduct, was killed Oct. 27 in an automobile collision as he was enroute to a California section A.W.W.A. meeting in Riverside.

John F. Casey, 77, chairman of the board of the construction and engineering firm of John F. Casey Co., died at Pittsburgh, Pa., Nov. 7. He was a director of the University of Pittsburgh and of the Carnegie Institute of Technology.

CONSTRUCTION ACTIVITY

CONTRACT VOLUME

Continental U. S. Only
(Millions of Dollars)

	Week of Nov. 11 1948	Cumulative 1948 (46 wks.)	Cumulative 1947 (46 wks.)	% Chge
Federal	$7.1	$845	$554	+53
State & Mun.	67.1	2,344	1,592	+47
Total Public	$74.2	$3,189	$2,146	+49
Total Private	63.6	2,983	2,792	+ 7
U. S. Total..	**$137.8**	**$6,172**	**$4,938**	**+25**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

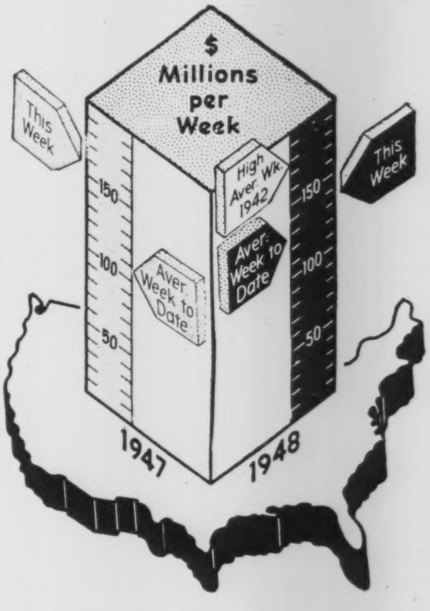
Dollar Volume (Millions)

Type of Work	This Week	Cumulative 1948 (46 wks.)	Cumulative 1947 (46 wks.)	% Chge
Waterworks.	$5.4	$176	$106	+66
Sewerage ..	2.9	199	150	+33
Bridges	7.9	257	167	+54
Highways ..	13.9	902	708	+27
Earthwork, Waterways.	15.1	463	272	+70
Buildings, Public	22.8	995	520	+91
Industrial .	19.5	977	800	+22
Commercial	40.8	1,636	1,618	+ 1
Unclassified.	9.4	567	597	— 5

NOTE: Minimum size projects included are: Waterworks and waterway projects, $28,000; other public works, $50,000; industrial buildings, $68,000; other buildings, $250,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1948 (46 wks.)	Cumulative 1947 (46 wks.)	% Chge
NON-FEDERAL ..	$3,993	$2,188	+ 82
Corporate Securities	1,855	906	+105
State and Municipal	1,646	$1,034	+ 59
U. N. Building Loan	65	....	....
Fed. Aid Highway	427	248	+ 72
FEDERAL	1,559	819	+ 90
Total Capital	**$5,552**	**$3,007**	**+ 85**



As Reported this week to...
Engineering News-Record

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost..	Nov.'48	478.25	229.89
Building Cost	Nov.'48	355.86	192.37
Volume	Oct.'48	291	128

EDITORIALS

VOLUME 141 NUMBER 20

November 11, 1948

And Now What?

TAKING THE TOTAL POPULAR VOTE for President as a measure, the election produced elation and dismay in approximately equal amounts. The actual ratio would be 1.05:1.00. But no emotion, least of all these extreme ones, constitutes the red meat that Americans feed on. They are too busy. Too many things are waiting to be done, too many problems are lying around unsolved. Back to the mines! This is the universal urge that now dominates victor and vanquished alike. And to implement it, all eyes turn to Washington. What happens next in this production center of ideas and actions, influential even to the ends of the earth? To find an answer, insofar as it affects the fortunes of engineers and construction men, our Washington correspondent combed his contacts and rifled his files, with the result reported on the news pages of this issue. You will find it worth reading. In brief, the prospects for construction are good.

On Standards and Codes

HIGHLY COMMENDABLE ACTION was taken by the California Section, AWWA, in adopting a set of standards of safe waterworks practice, a document whose preparation required much work and many compromises. It is also significant that the state legislature showed confidence in the organization by providing a place in state law for inclusion of such standards. The important point, however, is that the standards were drawn up voluntarily. Had this not been done it is probable that a set of similar, and most likely not as acceptable, rules would have been thrust upon the waterworks men by some state bureau. Too often, when technical groups are invited to comment on or make suggestions for such regulations, the members disagree among themselves to the extent that no unified action is possible. Building codes are a case in point. Disagreement among structural engineers in one West Coast city on provisions for earthquake-resistant design brought about insertion in the building code of provisions quite unsatisfactory to most of the engineers. Voluntary controls are much easier to live with than are those that are imposed. Other groups should follow the example of the California Section, AWWA, by cooperating with governing authorities on adoption of codes and standards.

Engineers Subject to the Draft

ANNOUNCEMENT that the engineering sciences are to be represented on the committees set up to advise the Director of Selective Service on deferment policies is welcome news. We do not believe in general deferment of young engineers or engineering students when there is a real emergency, but in times like these, if the flow of engineers into industry is to be maintained at the high level that now appears necessary, it should be possible to keep up that flow without making the task of draft boards in filling their quotas too difficult. Certainly, engineers should be the last to propose a plan that would inspire fond parents to send their sons to an engineering school to escape the draft.

An ideal plan would be one in which a period in military service could be integrated with engineering training, but presumably, too much is involved in that to make it practical after the passage of the draft law. The alternative is to lay down some principles to guide draft boards. For example, one board has called up a young instructor in an engineering school who cannot be replaced immediately because of the scarcity of teachers. He was not even given a deferment until the end of the current term. It is this type of unreasonableness that should be avoided. If the engineers and educators who have been called in to advise General Hershey can set up plans for meeting situations of this kind, they will have done much toward keeping the draft from needlessly disrupting activities that depend at least temporarily on young men who are eligible for the draft.

At best, what the advisors can do will be of a temporary nature. If Selective Service is to be with us for an indefinite period, more fundamental planning must be applied to the problem of keeping up the supply of all types of professional men—scientists and physicians as well as engineers.

Cooperative Pollution Abatement

POLLUTION ABATEMENT measures spurred on by state and federal rulings are getting results. One significant indication of this trend is the \$20-million waste-disposal program in the Calumet District area just outside of Chicago. This program had its origin five years ago when Illinois petitioned the U. S. Supreme Court to restrain four Indiana cities—Gary, Hammond, East Chicago and Whiting—and 20 industries in that area from discharging wastes into the Grand Calumet River.

A milestone in the program will be passed next spring when all sanitary sewage from the four U. S. Steel Corp. subsidiaries in Gary will flow to the municipal treatment plant. Design and construction features of the $2\frac{1}{4}$-million collector systems are described in this issue.

Highly commendable is the spirit of cooperation between the state health departments of Indiana and Illinois and the cities and industries affected in working out a solution to a difficult problem. In effect, the complaint of Illinois was conducted as a "friendly" suit. Following preliminary negotiations, the Supreme Court appointed a master to guide solution of the problem. Both Gary and Hammond had disposal plants when Illinois entered complaint; East Chicago completed its treatment facilities in 1945. After these plants provided capacity for additional sewage loads, several of the industries named installed collecting facilities for pumping wastes to city plants. One company constructed its own waste-treatment plant.

As demonstrated by the Calumet District antipollution projects, the solution to complex organization and technical problems arising from collection and treatment of sewage and industrial wastes can be made mutually satisfactory if a cooperative approach is exercised by industrial and civic officials.

More Money for Roads

New Jersey's decision to set up a turnpike authority with powers to build and operate toll roads does not necessarily mean that the state is convinced of the desirability of toll highways. Rather, the preamble to the act setting up the turnpike authority indicates that it is an expedient to which the legislature resorted to get more ready cash for badly needed road construction. As the credit of the state is not pledged to support the turnpike bonds, the amount of the bond issue can be made available for road construction without adding to the state's debt.

This claim that a state's credit is not pledged when a special authority is set up is a nice fiction that satisfies the state's fiscal officers. At the same time it causes no concern to those who sell the bonds issued to build toll roads as they know that no state could afford to let such an agency default. Moreover, they get a perfectly safe tax-exempt security carrying a higher interest rate than would be paid for the state's own bonds.

But as Roy E. Jorgensen, chief engineer of the Connecticut Highway Department, pointed out at the state highway officials recent meeting in Salt Lake City, this is an expensive way to get money for road building. The money costs more, the state is saddled with the cost of operating the toll facilities for an indefinite number of years and, due to the fact that the number of access points must be limited if operating costs are to be kept within reason, local people get less use out of the road than from a free road.

The chief argument in favor of toll financing is that it places the cost on people who are willing to pay for the better facilities; and in the case of states like New Jersey, some of the cost is paid by out-of-state motorists and truck operators. Yet this can only be done by placing the greater part of the cost on New Jersey road users; for every analysis of highway travel has shown that the bulk of movements are local—30 miles or less. And, as no federal-aid road funds can be used to build a toll road, the direct cost of a toll road to any state is nearly twice that of a similar free road.

To return again to Mr. Jorgensen's conclusions from his study of toll financing, willingness on the part of the public to pay tolls on the toll roads that have been built is indicative of willingness to pay an added tax to get better highways quickly. In other words, when current road revenues, including those diverted to other purposes, are not adequate for pay-as-you-go financing, the public can be expected to support a plan for bond financing. Under such circumstances, the public can get more roads and more road service through direct state bond issues than through the expedient of setting up turnpike authorities or commissions.

Despite our great need for better highways, the locations where toll roads can be justified are the exception rather than the rule.

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Record-Size Pump Plant at Coulee Dam Will Have 15,000 Sec-Ft. Capacity

WITH THE AWARD of a contract on October 7 to Morrison-Knudsen Co., Inc., and Peter Kiewit Sons Co., work is now under way on the construction of Grand Coulee pumping plant. The $13,348,400 structure will enclose the world's largest pumping installation — twelve vertical-shaft, centrifugal pumps (six now under contract) that will have a rated capacity of 1,350 sec.-ft. each and will be driven by 65,000-hp. motors.

These pumps are by far the largest ever built. Record pumps in the United States are 18,000-hp. size, and the previous world's record pumps were built in Germany about 1930 for use in the Ruhr Valley, rated at 36,000 hp.

The size of the pumps introduces many manufacturing and design problems.

For example, if the normal design of the open-throat volute casing without stay vanes had been used, the weight and cost would have been excessive. To withstand the high internal pressures due to the 365-ft. head, the large casing would have required very heavy stiffeners or ribs on the outside to prevent bursting or distortion of the pump. By adapting a diffusor-type casing, in which six vanes cast into the throat section take the internal bursting stress as well as the external vertical load from the motor, outside stiffeners are eliminated, and the casing weight is greatly reduced. The vanes are carefully designed to act as short diffusors, thus reducing the amount of velocity head to be recovered in the casing itself. The casing is also divided by a long rib which makes the casing a double volute type. The function of this rib is to improve velocity distribution at discharge and equalize radial loads on the pump shaft.

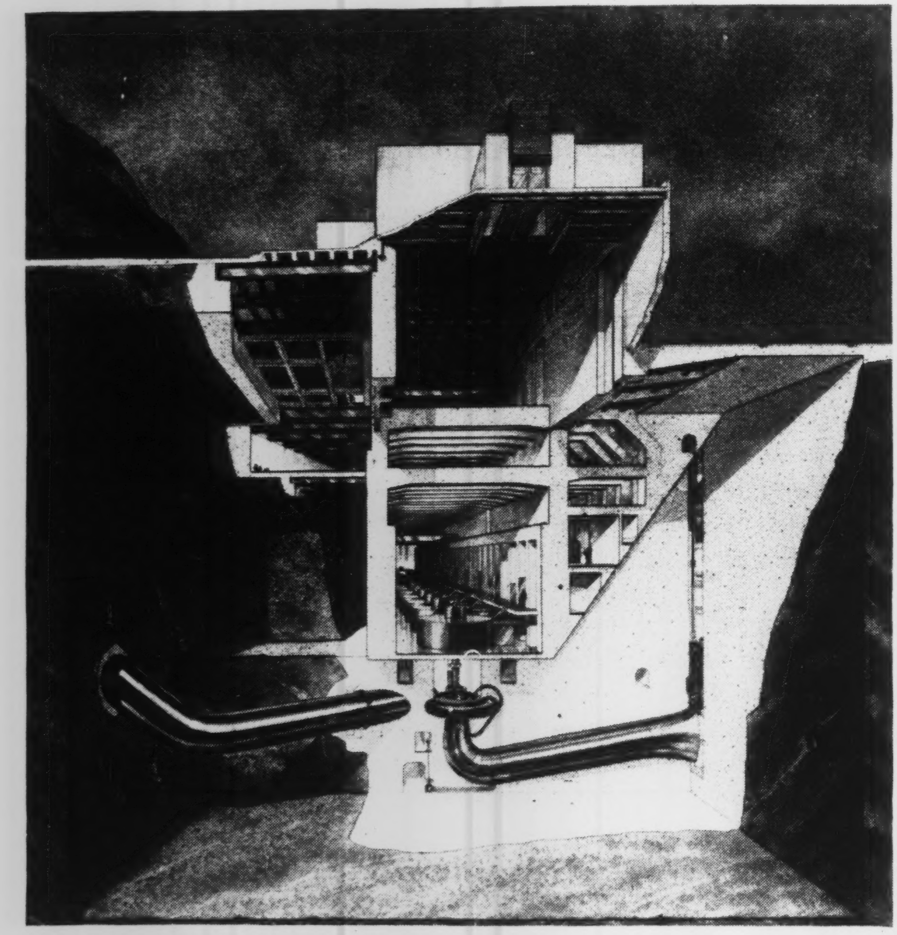


FIG. 1. ARTIST'S CONCEPTION of a cross-section of completed pump plant.

The recently awarded contract does not include the pumps or motors. However, it is the largest contract let on the Columbia Basin project since the building of Grand Coulee Dam. Beside the pump plant structure it includes excavation for a portion of the feeder canal that will connect with the reservoir to be located in the Grand Coulee. Also included is a completely-enclosed, 2 mg. reservoir of reinforced-concrete, installation of discharge pipes for the plant, construction of the feeder canal headworks and other miscellaneous work at Grand Coulee Dam.

More than half of the $13 million contract is for concrete work. Although less than 200,000 cu. yd. will be required, the concrete will cost almost $7,000,000. The unit prices vary from $17.16 a cu. yd. for 33,000 cu. yds. of concrete backfill around the pump discharge pipes to $450 a cu. yd. for 150 cu. yds. in the roof of the 2 mg. reservoir.

Next most costly item is for work in connection with furnishing and placing reinforcing bars. This will total more than $1½ million. Excavation work for the pumping plant will total more than $650,000.

Irrigate a million acres

This pumping installation is a primary part of the Columbia Basin irrigation project which will supply irrigation water for almost a million acres of now arid farm land in the eastern part of the state of Washington. Storage of Columbia River water for irrigation supply and power generation is accomplished by Grand Coulee Dam completed in

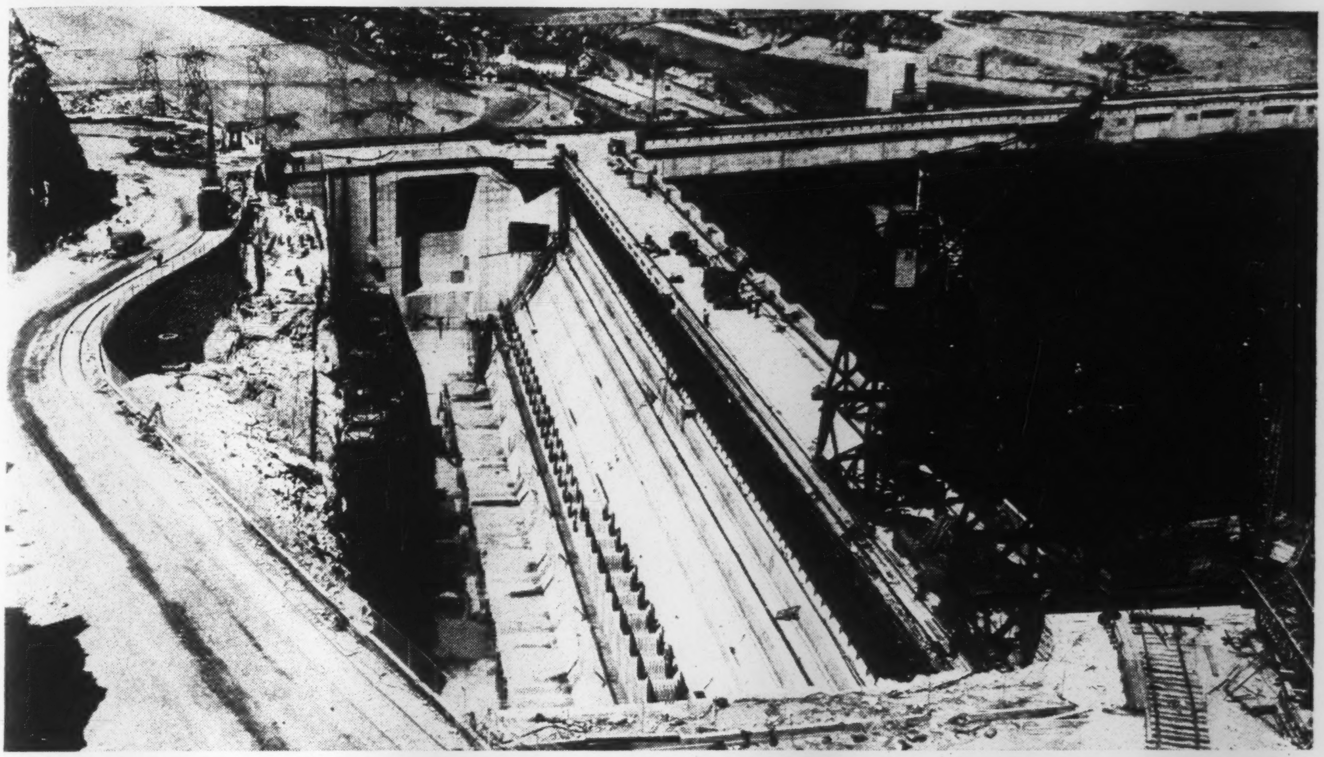


FIG. 2. THE PUMPING PLANT will be located behind this intake dam. Pump intakes have been covered with sand to prevent damage during scaling operations. Upstream side of Grand Coulee Dam is in right background.

1942. The power plants on the downstream side of the dam will have an ultimate rated capacity of 1,944,000 kw. and about one-third of this capacity will eventually be used to operate the pumps. The pumping plant, located just upstream from the dam structure on the west abutment, will pump water from the 9,500,000-acre-ft. reservoir to a canal leading to a 615,000-acre-ft. regulating reservoir formed by the construction of dams at each end of the Grand Coulee. From this reservoir, water will flow into the system of canals, tunnels, laterals, etc., part of which has been under construction for the past two years.

Studies of the water requirements in the project area indicate that the average annual water requirement will be some 3.7 acre-ft. per acre. Thus, the irrigation demand on full development of the project will approximate 4,000,000 acre-ft. per year. Some 23 percent of this annual demand may be required in one month and the system is being designed to meet this requirement.

The pumping plant is arranged for an ultimate installation of 12 main pumping units. Each pump will discharge through a 12-ft. diam. discharge pipe 850 ft. long. Total lift will vary from 270 ft. to 365 ft. depending upon the level of water in the two reservoirs. Each pump will be driven by a 65,000 hp., direct-connected synchronous motor.

Two motors will be supplied with power directly from one 108,000 kva. hydraulic turbine-driven generator unit in the Grand Coulee plant. The output of each generating unit varies from some 80,000 to some 135,000 kva., as the effective head on the turbines varies from 263 to 355 feet. During periods of low head on the turbines, it will probably be necessary to have a generator supply power to only one, instead of two, pumping unit.

Part of plant already built

Part of the pumping plant was built at the time of the construction of the dam. This includes the pumping plant dam, the intake structure and trash racks, the pump inlet pipes, and the discharge tunnels. Work yet to be done includes construction of the pumping plant itself and placing the discharge pipe in the tunnel as well as construction of the outlet facilities and canal to the regulating reservoir.

Some of this work was being done on a day labor basis when the appropriation bill for the fiscal year of 1948 became effective. This bill prohibited force account work by the Bureau. Other portions of the Col-

TABLE I—PUMP DATA, GRAND COULEE PUMPING PLANT

Anticipated performance as calculated from model tests:	
Capacity (310-ft. head) (cfs.)	1,450
Efficiency (310-ft. head) (%)	88.9
Brake horsepower (270-ft. head)	60,100
Required pump performance and design data:	
Capacity (310-ft. head) (cfs.)	1,350
Pump efficiency (310-ft. head (%)	87
Input to pump (270-ft. head) (hp.)	Less than 65,000
Max. reverse speed (rpm.)	275
Dia. of shaft (in.)	27
Net weight of pump (lb.)	450,000
Net weight of heaviest part (lb.)	80,000
Weight of revolving parts (lb.)	120,000

umbia basin project already under contract had obligated the funds available for contract work so no further work could be done on the pumping plant until the 1949 fiscal year funds became available.

Prior to this time, contracts had been let for six of the pumps and six of the motors. The contract for furnishing six vertical-shaft, centrifugal pumps was awarded on May 28, 1946, to the Pelton Water Wheel Co., and Byron Jackson Co. of San Francisco on a bid of $1,049,325 f.o.b. San Francisco.

Two separate contracts for the furnishing and installing of six of the 65,000-hp., direct-connected, synchronous motors were awarded on October 15, 1946. The General Electric Co. was awarded the contract for two motors on its bid of $854,522 and the Westinghouse Electric Corp. was awarded a contract for four motors on a bid of $1,620,026.

Model tests by bureau

Because of the unprecedented size of the installation, the Bureau of Reclamation had made hydraulic model tests on all features of the installation. Extensive research was carried out in the hydraulic laboratory of the California Institute of Technology on pump models to develop and verify the design, including the design of the inlet elbow, and to determine the hydraulic performance, the limitation of specific speed as affecting cavitation and the characteristics over the entire range of pumping heads.

Based on these tests, pumps were specified to have 1,350 cfs. capacity at 310 ft. pumping head and to be 87 percent efficient at that head. To verify detail design of the pump, specifications required manufacture of a model with an impeller not less than 12 inches in diameter. Actual design, manufacture and test of the model was performed by the Byron Jackson Co. The Pelton Water Wheel Co. made the mechanical design and is now manufacturing the full size pumps.

Primary problem in manufacturing is one of size. The pump casing will be made of a cast steel diffusor ring and a plate steel spiral casing. The diffusor ring casting will be of near record size. Thus, it will require considerable manufacturing skill and facilities.

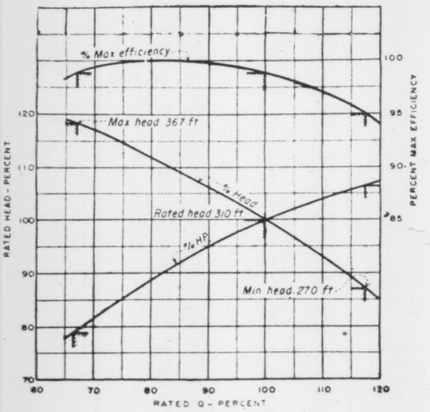


FIG. 3. CHARTS give the typical pump characteristics as specified by the Bureau of Reclamation for a normal operating speed of 200 rpm.

These two parts are welded together to make the complete pump casing. This built-up casing is made in halves and is to be bolted together in the field.

Structure of interest

The plant itself will be a reinforced structure 600 ft. long founded directly upstream from the face of Grand Coulee dam. The overall height from the lowest point of the foundation to the top of the office wing of the pumping plant structure will be 195 ft. (about the equivalent of a 15 story office building). The top of the plant will be level with the roadway on top of the intake dam and this will make it possible to drive directly from the road at the west bank on to the pumping plant roof. About one half of the plant will be roofed over at this level and partly used for visitors parking. Over the remainder will be a storage and crane building with its floor at the same level.

The building is divided into 13 sections and one complete pumping unit will be housed in each of 12 of these sections. The remaining section at the south end will be for erection space. This erection bay will be left clear for a height of 130 ft. above the motor floor to permit lowering of equipment by means of the crane installed on the storage building above. Since the columns in this open area have no direct lateral support for their entire height, heavy rigid girts were provided at intermediate points. A cross wall, anchored into the intake dam, will give rigidity to the walls at the open side toward the pumping units.

Heavy floor loads in the pumping plant at a distance 64 and 85 ft. above the base of the columns impose severe earthquake loads. To resist these forces, the structure was anchored to the intake dam as high up on the dam as safety would permit. This was accomplished by means of rigid bents framing into girders supporting one of the pumping plant floors. These bents were so framed that they did not make a direct horizontal tie into the crane columns.

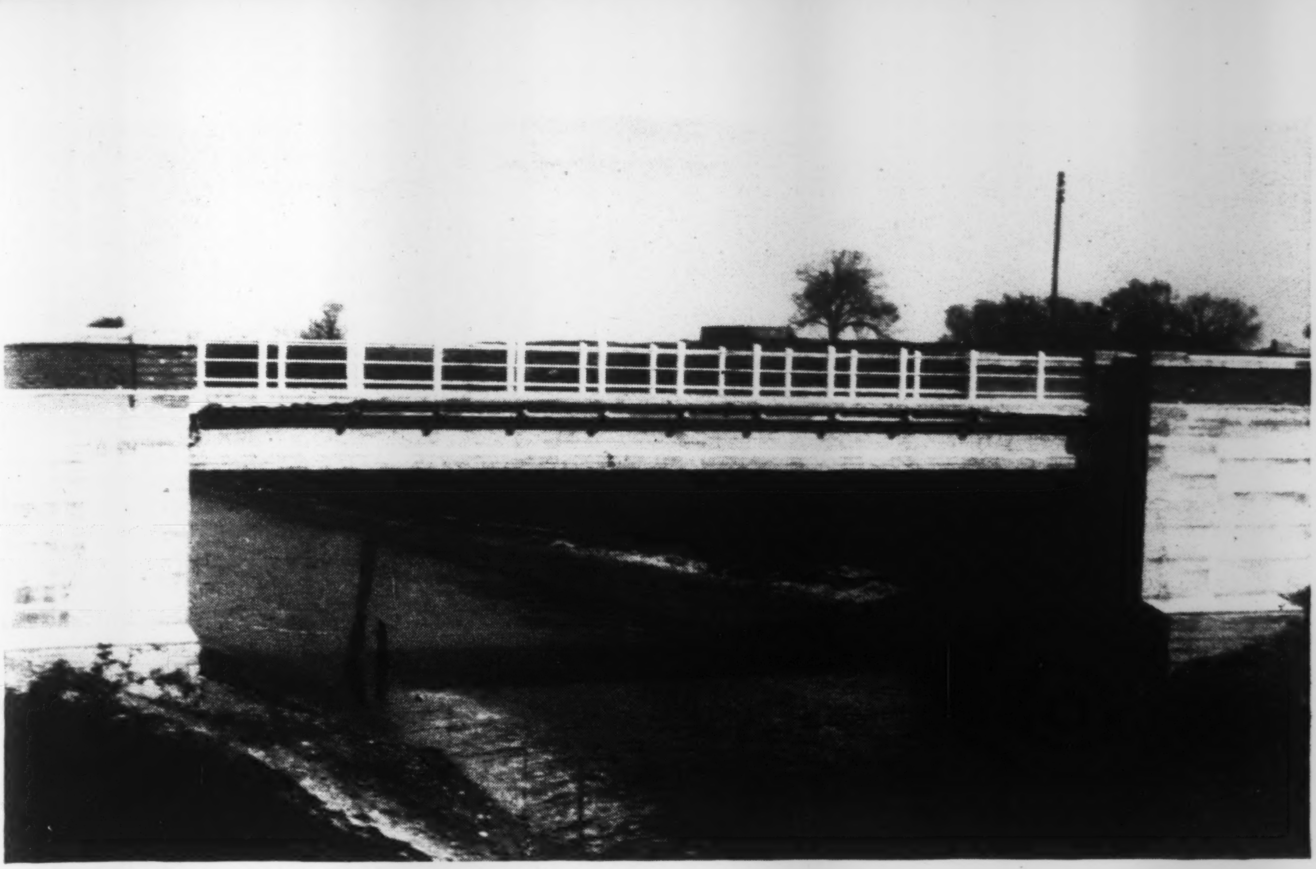
Dowels hold seamy foundation rock

During excavation for the intake dam and pumping plant, lift seams in the rock were encountered. These seams—fractures that developed in the rock as the stress conditions were altered by the progressive erosion of the overlying strata—dipped toward the pumping plant at an angle some 45 deg. This condition was viewed with concern as it was feared that rock masses above these seams in the high wall on the discharge side of the plant might eventually loosen and slide down on the structure.

To make the plant safe from such a hazard during earthquakes, dowels were used to anchor the rock above the seams. Six in. holes at 20 ft. centers were drilled through the rock above the lift seam and into the solid rock under them for a distance equal to the required bond length. In each hole a bundle of steel reinforcement was inserted consisting of eight 1¼ in. sq. bars and two 1-in. sq. bars. These were grouted in place through a ½ in. pipe inserted with the reinforcing bars.

Supervisory personnel

The Grand Coulee pumping plant was designed in the Denver office of the Bureau of Reclamation. L. N. McClellan is chief engineer and structural design was supervised by Samuel Judd. Design of the pumps was supervised by I. A. Winter, head of the hydraulic equipment design section. F. A. Banks is district manager of the Columbia River district and Alvin Darland is in direct charge of the pumping plant construction.



Maximum waterway and minimum girder depth afforded by England's first . . .

Prestressed Cast-in-Place Concrete Bridge

Reported to be the first prestressed concrete cast-in-place highway bridge to be built in England, the new Nunn's bridge over Hob Hole drain at Fishtoft near Boston, Lincolnshire, has a span of 74 ft. c. to c. of bearings, with an 8-in. roadway slab on 43-in. concrete deck girder beams. The following brief description of its design and construction has been abstracted from an article in the June 25, 1948 issue of the English journal, *Engineering*. Illustrations were furnished by the Cement and Concrete Association, London.—Editor.

Decision to replace the old Nunn's bridge—built by John Rennie about 140 years ago as a three-span brick arch—with a single-span prestressed cast-in-place concrete bridge was motivated by a desire to reduce the dead load, minimize the amounts of steel and concrete needed, eliminate obstructions to flood water, and provide the maximum possible waterway area.

Certain economies were possible through strengthening the old abutments to carry the new concrete deck girder span, while construction was simplified by using the two old piers for temporary supports for the falsework.

The new bridge contains five prestressed concrete longitudinal girders spaced 4 ft. $6\frac{3}{4}$ in. c. to c. and five full-depth cross-beam diaphragms. It carries a 17 ft. clear roadway built to a $1\frac{1}{2}$-in. transverse crown, and galvanized steel tube handrails on precast concrete posts.

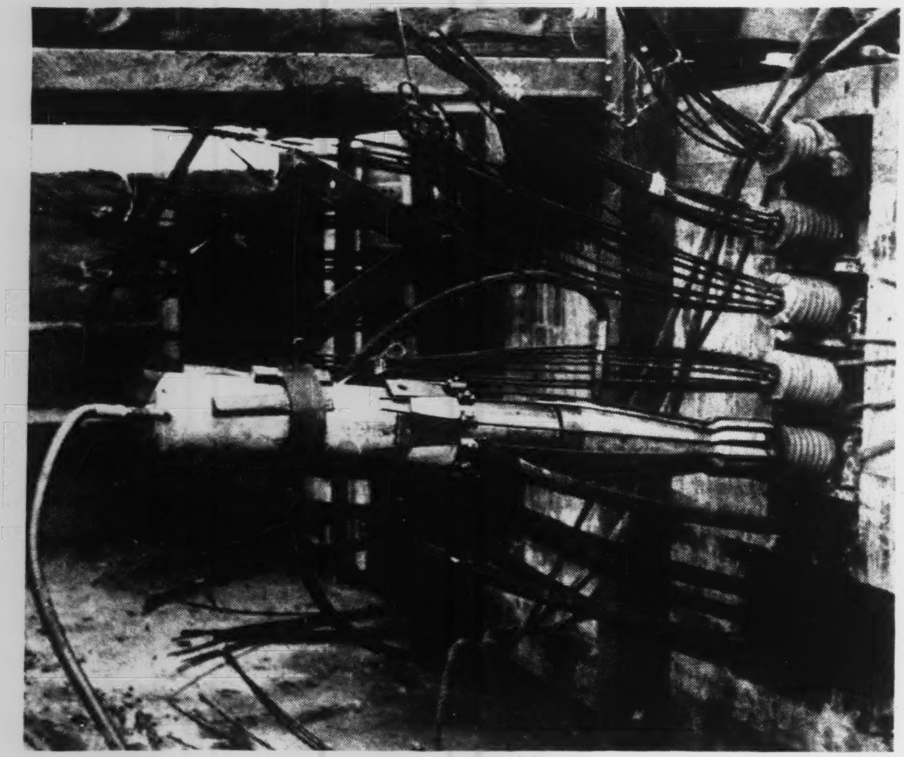
Each girder was prestressed with twelve 1-in. cables, encased in a metal tube made of 30-gage strip steel to prevent bonding with the concrete. Cables were located in the bottom, flanged section, of girders at the center of span, and bent up into the girder web and deck slab at the abutments. Mild-steel reinforcement was used throughout the deck and cross-beams, and also for the $\frac{3}{8}$-in. stirrups spaced 12 in. apart in the main girders of the new structure.

Each prestressing cable was about 1 in. in dia., containing twelve 0.2-in. high-tensile steel wires over a bobbined core. In forming the cables, the high-tensile wires were laid longitudinally around the core which was made up of 16-gage steel wire wound as a close coil spring on a $\frac{1}{2}$-in. core, and subsequently stretched to a $\frac{1}{2}$-in. pitch. Cables were fabricated at the bridge site.

Concrete in the bridge was designed for at least 6,000 psi. compressive strength at 18 days. About eight sacks of cement were used per cubic yard of concrete and the water-cement ratio was 0.47. External vibrators were used when placing concrete.

Bridge seats added

Following the removal of the old brick superstructure, new reinforced concrete bridge seats embedded in mass concrete abutment walls and supported on precast concrete piling and steel sheetpiling were added immediately in front of the old brick abutments. Falsework for the new



A TOTAL PRESTRESS of 26 tons was induced in each 12-wire cable by a Freyssinet hydraulic jack, producing an estimated 2,000-psi. compressive stress in the bottom flange of the concrete girders.

deck was timber planking on trussed steel joists supported on the old piers and abutments.

Each cable stressed 26 tons

The concrete girders, cross-beams and roadway slab were cast in place on this falsework. Prestressing was begun when the concrete had reached a specified compressive strength of 6,000 psi. Each cable was stressed to 140,000 psi., using a Freyssinet hydraulic jack at each end with load being applied simultaneously on both jacks. This prestress of 140,000 psi. represented a tension of about 2.2 tons on each wire or a total of 26 tons on each cable. After being stressed, each cable was locked by forcing a cone into a socket under a force of 20 tons applied by a secondary jack. The wires passed between cone and socket, and the sockets bore on a steel plate bolted to the concrete.

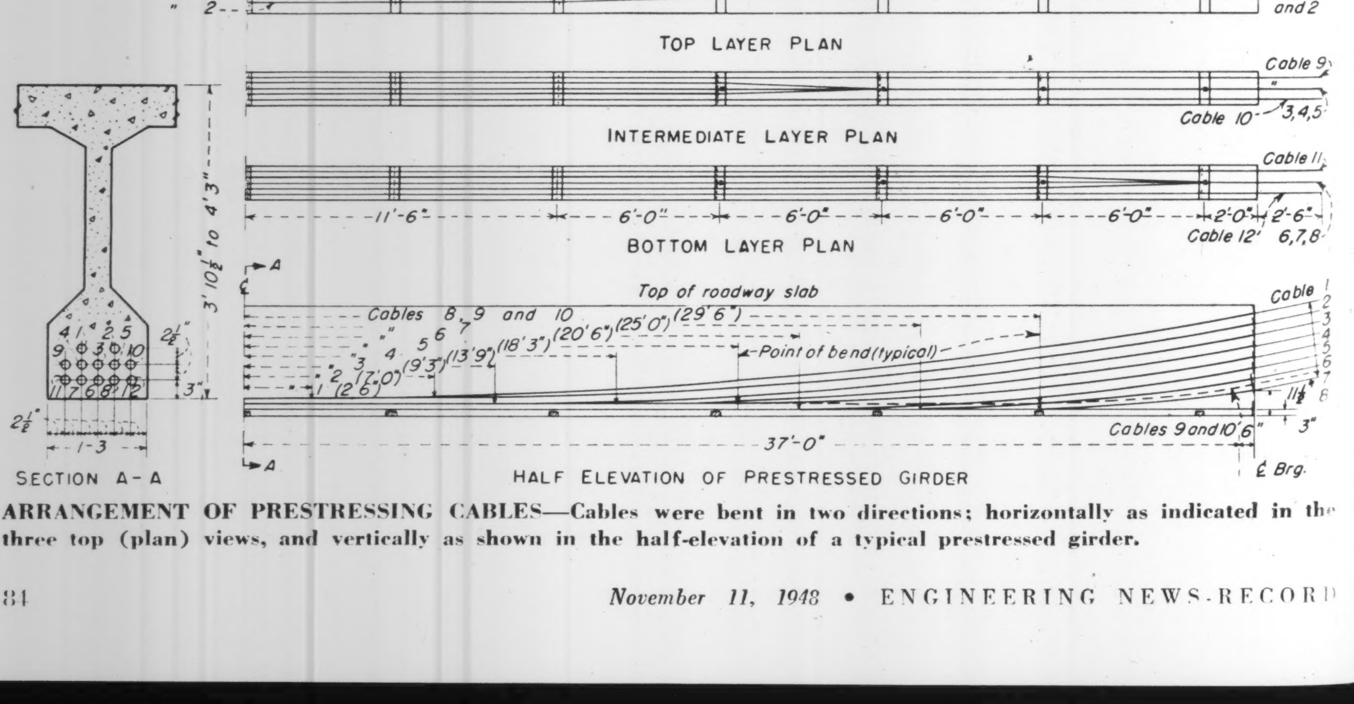
The order of stressing cables was from the bottom to the top rows. Two cables were stressed in one beam, then similar pairs were stressed in the other beams before proceeding to the next higher pair in the first beam.

Stressing of the cables to 140,000 psi., in effect, imparted a reverse loading to the bridge. In fact, it induced a ⅝-in. camber at the center of the span in addition to the permanent 4-in. dead load camber.

It was calculated that the total prestress in the cables induced an initial compression of 2,000 psi. in the bottom flange of the concrete girders, and 100 psi. at the top of the concrete roadway slab.

By these calculations, the entire live load for which the bridge is designed—220 lb. per sq. ft. of roadway plus a moving line load of 2,700 lb. per ft. width of roadway—will just be sufficient to overcome the compression in the bottom of the prestressed concrete girders. Total weight of the concrete superstructure, exclusive of handrails, is 140 tons. Total design live load, handrails and 3-in. asphalt wearing surface on the roadway is 205 tons.

After prestressing, the cables were grouted under pressure. Since the cables were hollow, they were first filled with water to expel all air and prevent air being pocketed in the grout. A cone-shaped vessel containing the grout was connected at its


Cable 1
" 2
Cable 1 and 2
TOP LAYER PLAN
Cable 9
"
Cable 10
3,4,5
INTERMEDIATE LAYER PLAN
Cable 11
11'-6"
6'-0"
6'-0"
6'-0"
6'-0"
2'-0"
2'-6"
Cable 12'
6,7,8
BOTTOM LAYER PLAN
3' 10½" to 4' 3"
2½"
3"
2½"
1-3
4 1 2 5
9 3 10
11 7 6 8 12
SECTION A-A
A
A
Top of roadway slab
Cables 8, 9 and 10
7
6
5
4
"
"3
2
1
(2'6")
(7'0")
(9'3")
(13'9")
(18'3")
(20'6")
(25'0")
(29'6")
Point of bend (typical)
Cable 1
2
3
4
5
6
7
8
11½
Cables 9 and 10 6"
3"
37'-0"
℄ Brg.
HALF ELEVATION OF PRESTRESSED GIRDER

ARRANGEMENT OF PRESTRESSING CABLES—Cables were bent in two directions; horizontally as indicated in the three top (plan) views, and vertically as shown in the half-elevation of a typical prestressed girder.

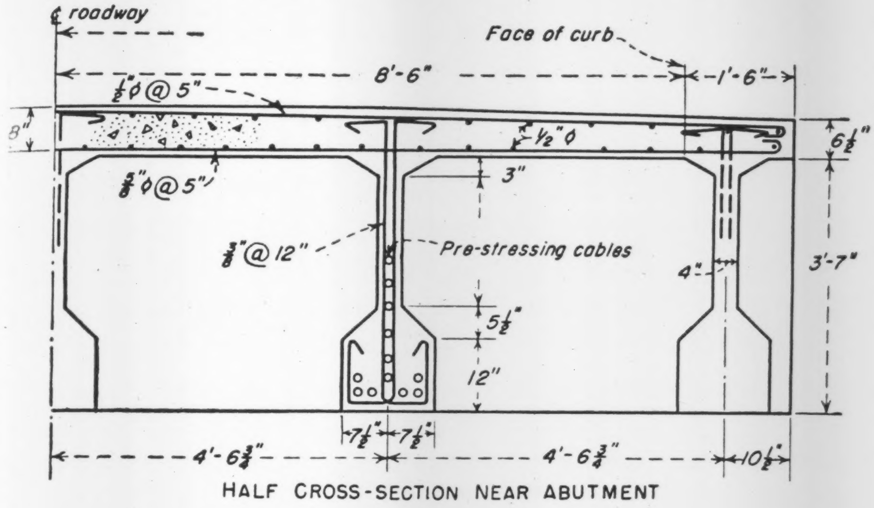


FIG. 4. PRESTRESSED CONCRETE GIRDERS, 15-in. wide at bottom to embed all 12 cables at center of span, have 4-in. webs to save concrete. Near the abutments, upper cables are bent horizontally for embedment in web.

pointed end to one end of the cable. Compressed air then was introduced into the top of the grout-cone, forcing grout into the core of the cable and expelling the water at the other end.

Followed the Freyssinet process

L. G. Mouchel and Partners, of London, were consulting engineers on the work, with the design and supervision of the prestressing being performed in accordance with the Freyssinet process, by the Pre-Stressed Concrete Co., Ltd., also of London. The reconstruction work was carried out directly by the Witham Fourth District Internal Drainage Board, under the supervision of Gilbert E. Buchner, engineer to the board, and A. J. A. Roseveare, deputy engineer.

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Notes on Legal Decisions

Summaries of decisions relating to construction prepared by I. Vernon Werbin, counselor at law and engineer, New York

Sufficiency of Plans And Specifications

Where a party furnishes plans and specifications that the contractor must follow, he impliedly guarantees their sufficiency to accomplish the desired result[1]. The contractor is not responsible for the defects that are the result of faculty plans or specifications, if required to follow them, unless he has in some manner warranted their sufficiency to accomplish the desired result[2, 3].

Where a contractor makes an unqualified contract to construct a building or to perform a certain undertaking it is the general, and perhaps universal, rule that he assumes the risks attending the performance of the contract. He must repair and make good any defect that develops before the completed work is accepted by the other party. But under a contract to perform in accordance with prescribed plans and specifications he is not permitted to vary from them, even if he deems them improper and insufficient. Hence, the contractor cannot be held to guarantee that work performed as required will be free from defects, or withstand the action of the elements, or accomplish the purpose intended. Where the contract specifies what he is to do and the manner and method of doing it, and he does the work specified in the manner specified, his engagement is fulfilled and the contractor remains liable only for defects resulting from improper workmanship or other fault on his part[4].

But a contract provision to accept responsibility will be upheld[5]. Of course where the plans and specifications are prepared by the contractor or his agent, he is responsible for any defects in the work that may result from the insufficiency of the plans and specifications[6].

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(1) Montrose Contracting Co., Inc. v. County of Westchester, 80 F.(2d) 841.
(2) Baber v. Baessell, et al., 85 F.(2d) 725.
(3) Bruton v. Sellers & Marquis Roofing Co., 168 S.W.(2d) 101.
(4) State v. Commercial Casualty Ins. Co., 248 N.W. 807.
(5) Philadelphia Housing Authority v. Turner Construction Co., 23 A.(2d) 426.
(6) Barraque v. Neff, et al., 11 So.(2d) 697.

Waiver of Specifications

Where the owner knows that the contractor is performing the work contrary to the specifications and raises no objection, he may be deemed to have waived the requirements of the specifications[1].

A waiver implies an intention to overlook a deficiency or to forego a right to have the defect remedied or to have compensation. It necessarily implies knowledge of the defect that is waived, or acquiescence under circumstances reasonably implying unconditional acceptance of the work as a full performance[2].

If a builder is not complying with the contract, it is the duty of the owner or architect to object to such work or material as does not comply. After failure to object the owner cannot, after the work is completed, claim that the work or materials was not in accord with the contract[3].

Acceptance under protest is not a waiver. Mere failure of the owner to take over the work when he discovers the builder is not complying strictly with the contract does not waive his right to damages for defects[4].

Where the final certificate is issued with an understanding that all defects in the work will be corrected, acceptance does not imply a waiver of the right to have the defects corrected[5].

A party who, standing by, has concurred in and accepted what the other party did in fulfillment of the contract is not in a position to deny that the contract has been fulfilled[6].

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(1) Fielding & Shedley, Inc. v. Dow, 163 P. 2nd, 908.
(2) Otto Misch Co. v. E. E. Davis Co., 217 N.W. 38.
(3) C. J. p. 797.
(4) C. J. p. 797.
(5) Otto Misch Co. v. E. E. Davis Co., 217 N.W. 38.
(6) Miller v. Gray, 217 N.W. 228.

State Highway Officials Ask Study Of Wages on Road Maintenance

PAY in the maintenance divisions of the state highway departments is so far out of line with pay in the manufacturing industries as to call for an extensive study looking toward substantial increases in highway pay. This is the conclusion of a joint committee of the American Association of State Highway Officials and the Highway Research Board that has been studying this subject for some time.

In its report to the annual meeting of the American Association of State Highway Officials at Salt Lake City, this joint committee recommended that an extensive job analysis and evaluation study be made to establish salaries and wages that are more closely in line with the pay in industrial establishments. The committee suggests that such a study should be made on a national scale by some such agency as the Highway Research Board or the Public Roads Administration.

Average hourly wage rates in the manufacturing industries and in the maintenance of highways are compared in Fig. 1. The manufacturing employee received an average of \$0.55 per hour in 1935 and now is up to an average of \$1.25 per hour, whereas the highway maintenance employee who received an average of \$0.42 per hour in 1935 now receives only \$0.88 per hour. Since 1940, although highway maintenance labor has received nearly the same percentage increase as manufacturing labor, it has not had the same dollar increase, which creates a definite tendency for labor to move from the highway maintenance field to manufacturing industries.

Wide salary variations

Another factor that is causing widespread unrest on the state highway departments, the committee finds, is the wide variation in salaries in the salary classification in the several state highway departments. Some of this variation can be accounted for by the difference in the type of work done by men carrying the same or similar titles in different highway departments, and some of it is due to regional variations in living standards and costs, but the committee does not believe that "job content" varies as widely as the figures given in the accompanying table would indicate.

Typical variations cited by the committee are as follows, the figures being for July 1, 1948: the average salary of a mechanic varies from \$173.33 to \$310.00 per month: the

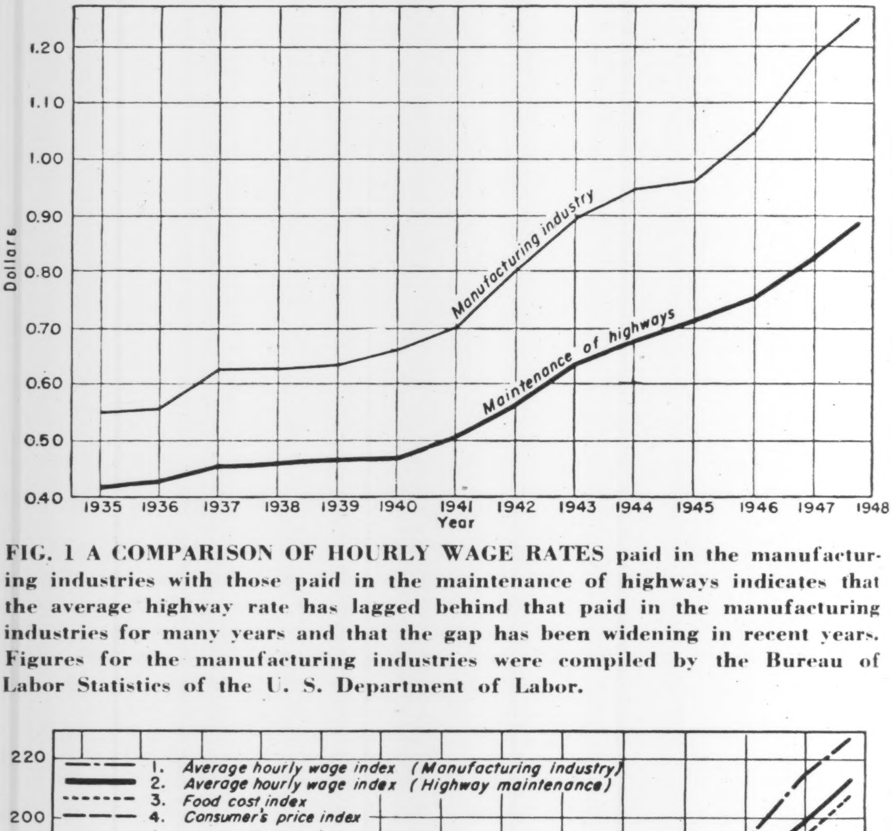

FIG. 1 A COMPARISON OF HOURLY WAGE RATES paid in the manufacturing industries with those paid in the maintenance of highways indicates that the average highway rate has lagged behind that paid in the manufacturing industries for many years and that the gap has been widening in recent years. Figures for the manufacturing industries were compiled by the Bureau of Labor Statistics of the U. S. Department of Labor.

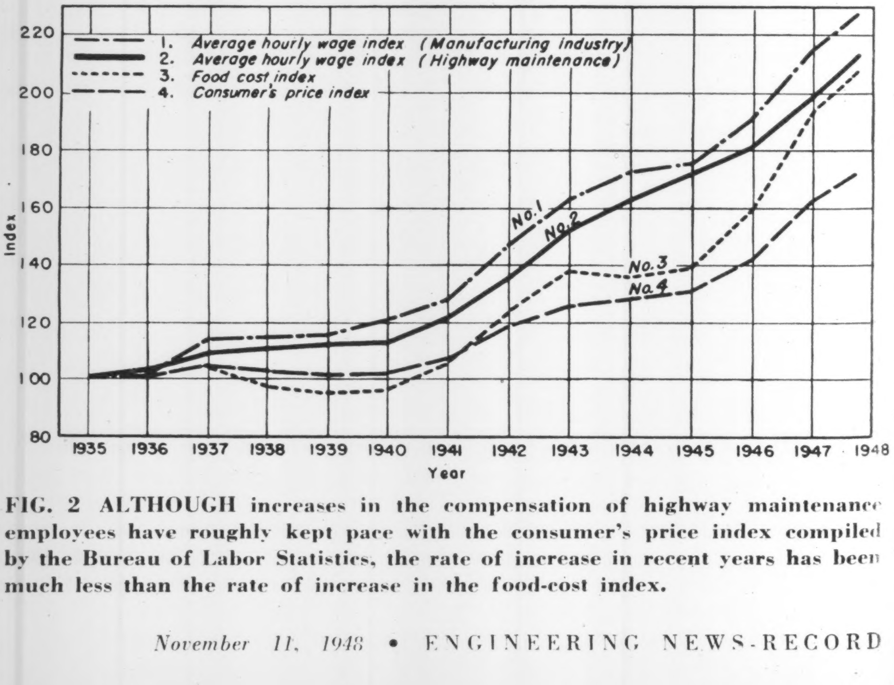

FIG. 2 ALTHOUGH increases in the compensation of highway maintenance employees have roughly kept pace with the consumer's price index compiled by the Bureau of Labor Statistics, the rate of increase in recent years has been much less than the rate of increase in the food-cost index.

MINIMUM-MAXIMUM MONTHLY SALARIES OF HIGHWAY PERSONNEL

(AS OF JULY 1, 1948)

MAINTENANCE PERSONNEL

State	State Maintenance Engineer			Assistant Maintenance Engineer			Division Maintenance Engineer			Asst Div Maintenance Engineer			District Maintenance Engineer			Garage Foreman		
	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max
Alabama	1	440	440	2	370	395	5	350	365				31	275	310	9	235	265
Arizona																		
Arkansas	1	375	375	5	288	288	10	350	350	10	250	250	75	175	175	10	265	265
California	1	676	821	6	458	676	11	458	556	11	415	505	59	395	481	12	325	395
Colorado	1	500	625	1	350	400	8	350	400							7	230	268
Connecticut	1	647	779	3	510	620	7	301	515				6	328	394	11	240	285
Delaware	1	600	600		483	483	3	345	405	2	285	345				3	245	285
Florida	1	400	500				5	300	400				17	250	350	16	150	240
Georgia	1	483	483	4	350	425	5	300	375				13	200	275	8	185	400
Idaho	1	440	440	1	352	352	5	324	352							5	305	305
Illinois	1	605	745	1	575	660	10	480	580	10	395	485	44	395	485	14	275	310
Indiana	1	500	540	3	390	475	6	360	400				26	250	350	36	191	208
Iowa	1	517	517	4	295	400	6	350	350				24	305	305			
Kansas	1	432	507	1	376	505	6	324	436				27	231	309	7	231	309
Kentucky	1	345	375	1	335	360	19	300	335				31	190	250	18	270	302
Louisiana																		
Maine	1	486	486	2	356	356	5	257	325				37	213	213			
Maryland	1	598	747	1	449	561	5	389	486				23	321	461	12	202	252
Massachusetts	1	500	625	1	425	550	7	410	510	13	255	395	25	230	280	3	145	245
Michigan	1	830	730	1	505	605	8	415	475	16	280	320	24	230	270			
Minnesota	1	578	658	2	502	572	16	436	496				16	254	294	16	254	294
Mississippi	1	375	475	4	250	425	7	275	400				23	250	340	10	225	325
Missouri	1	500	500	2	435	460	10	400	435	11	355	400	51	325	350	10	315	350
Montana	1	450	525	1	400	450	11	350	400				8	288	288	11	312	312
Nebraska	1	470	510	1	370	395								270	365		235	275
Nevada	1	420	455				3	350	420	4	315	350	8	250	280	5	280	315
New Hampshire	1	404	449				9	259	289				9	220	253	8	236	259
New Jersey	1	625	750	1	375	450	10	325	375							11	200	300
New Mexico																		
New York	1	1045	1045	1	967	967	10	558	678				63	436	534	11	342	425
North Carolina	1	425	525				10	375	450	30	300	390	81	250	325	45	200	275
North Dakota	1	430	430				5	350	360				1	300	300	8	235	290
Ohio	1	475	475		468	468	12	385	417	51	276	334	88	272	332	12	272	334
Oklahoma																		
Oregon	1	450	550	1	400	490							17	320	400	5	290	360
Pennsylvania	1	525	656	1	394	437	12	354	394							66	213	236
Rhode Island	1	385	475	1	295	365	6	230	280							3	200	240
South Carolina	1	460	460	1	400	400	8	400	400				46	300	330		200	220
South Dakota	1	440	440				7	250	275									
Tennessee																		
Texas																		
Utah	1	370	370										4	275	275	1	305	305
Vermont							12	330	393							1	270	270
Virginia	1	538	618	2	450	534				43	350	422	167	201	332	8	260	332
Washington	1	510	560	1	460	500	6	410	450	6	350	400	27	350	350	6	310	310
West Virginia	1	450	450	1	380	380	10	415	415	28	225	330	55	260	270	10	250	260
Wisconsin	1	580	685	2	445	590	9	375	525	15	250	445						
Wyoming	1	490	490				7	358	407				1	330	330	1	336	336

State	Gang Foreman			Sectionman			Mechanic			Equipment Operator			Mechanic Helper			Clerk Or Timekeeper		
	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max
Alabama	109	150	200				95	200	230	125	185	220	13	125	155	13	145	185
Arizona																		
Arkansas	20	195	195				40	195	238	450	156	217	40	130	195	10	135	135
California	301	281	341	160	243	295	162	255	310	915	231	281	25	200	243	69	255	310
Colorado	17	215	267	151	180	218	30	185	223	17	245	282				16	145	230
Connecticut	11	279	323	112	235	279	78	227	250	35	227	250	23	201	216	12	146	279
Delaware	12	215	245	69	186	186	13	195	245	29	182	182	3	155	185	7	185	245
Florida	220	130	215				52	140	205	162	130	225	8	130	165	18	195	240
Georgia	45	150	235	162	140	175	52	125	250	198	115	175	13	100	155	1	140	140
Idaho	14	225	275	78	235	235	55	260	290	52	240	270	12	230	245	15	150	225
Illinois	78	190	245	641	180	240		230	275	14	230	275		160	205	29	160	205
Indiana	87	165	199	485	182	182	127	150	191	818	155	165				36	160	225
Iowa	120	210	240				68	210	240	1100	165	215						
Kansas	31	200	267	332	165	220	63	173	231	174	150	242				27	157	210
Kentucky	79	160	220	126	155	210	168	151	270	561	130	173	26	119	162	15	110	135
Louisiana																		
Maine	28	200	200	414	156	156	36	189	208	55	189	250	21	177	189			
Maryland	95	190	238	51	190	238	42	190	238	109	185	232				25	183	229
Massachusetts	73	190	240	33	180	205	32	200	260		215	270	74	180	205	8	165	215
Michigan							25	210	230	260	175	215	7	175	195	20	195	215
Minnesota	38	224	264	441	184	214	60	224	264	81	224	264	24	164	194	55	140	254
Mississippi	41	150	240	200	100	190	39	150	240	168	100	240	26	100	150	12	100	240
Missouri	36	280	325	611	160	235	70	205	245				20	150	195	28	230	280
Montana	19	276	276	120	264	264	51	287	287	161	254	287	8	242	242	53	200	275
Nebraska		215	235		195	205		195	220		180	190		180	205			
Nevada				58	235	260	32	235	260	73	235	260	6	215	235	5	260	295
New Hampshire				115	210	210	33	194	215	61	172	191	16	153	194			
New Jersey	96	225	275	66	200	220	61	170	220	35	160	230	23	140	170			
New Mexico																		
New York	135	204	264	400	187	221	130	198	237	375	169	277	165	169	198	75	195	253
North Carolina	480	175	235	650	160	220	440	125	225	730	145	205	100	110	165	60	100	200
North Dakota	32	205	299	52	156	221	41	182	299	313	182	247				8	155	200
Ohio	28	208	272	575	189	272	295	218	332	482	194	332	89	194	272	115	196	266
Oklahoma																		
Oregon	33	240	360	133	240	300	72	252	263	107	235	290	24	232	232	66	150	245
Pennsylvania				1304	182	182	275	173	208	2100	173	208				218	182	182
Rhode Island				25	179	179	18	273	273	121	160	170	8	156	156	6	194	194
South Carolina		190	210	300	190	210	50	200	220							48	140	200
South Dakota	29	275	300	99	230	250	23	220	260	338	225	260	25	220	260	15	110	240
Tennessee																		
Texas																		
Utah	102	227	256	27	227	256	29	227	256	27	248	256	17	220	240	10	185	240
Vermont	15	205	300	159	175	275	13	200	240	75	200	260	38	165	175	4	130	200
Virginia	335	163	195	714	140	160	67	201	245	364	163	195	123	163	195	149	135	152
Washington	16	250	300	230	240	240	120	285	285	615	220	240	30	240	240	24	240	240
West Virginia	390	160	210				46	215	230	2228	115	252	225	187	212	180	157	187
Wisconsin	Field Maintenance Operations Handled Thru County Organizations																	
Wyoming	30	286	303	7	242	286	21	220	319	129	225	275				2	215	248

State	Skilled Labor			Common Labor			Project Engineer			Chief Of Survey Party			Plans Designer			Bridge Designer			Chief Clerk		
	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max	No	Min	Max
Alabama	42	160	230	874	85	170	31	225	280	3	260	290	13	215	335	6	255	360	6	220	300
Arizona																					
Arkansas	300	195	271	400	138	138	35	275	325	5	250	300	11	210	290	8	250	315	5	250	250
California	19	200	243	574	200	243	108	358	505	43	341	505	353	318	505	1	415	505	14	376	458
Colorado	88	229	312	477	139	218	44	300	350				13	245	350	8	245	350			
Connecticut	370	216	227	385	201	201	19	361	425	144	295	361	11	361	425	6	425	515			
Delaware	50	168	168	182	150	162	19	215	285	6	215	285	6	245	405	1	285	345	2	245	285
Florida	604	96	275	893	96	180	124	230	365				19	215	325	5	225	325			
Georgia				1700	110	155	87	250	325	20	225	350	49	130	500	10	175	425			
Idaho		240	270	210	190	190	55	302	357				5	308	338	1	412	412	5	250	275
Illinois	428	145	240		125	175		340	400		340	400		340	400		395	485	1	275	320
Indiana				428	156	156	75	300	370	10	250	305	17	300	370	15	300	370			
Iowa				75	150	160	24	285	305	7	265	265	6	225	350	11	285	360			
Kansas	254	157	254		128	190	55	294	393	3	294	395	13	294	395	8	294	395	7	220	294
Kentucky	1011	130	173	1083	130	151	60	240	310	9	240	315	6	240	300	12	300	335			
Louisiana																					
Maine				700	156	156	65	256	360												
Maryland	356	180	225	701	166	187	58	242	401	10	220	275	11	320	485	17	320	485	7	256	403
Massachusetts	256	180	205	495	175	200	175	255	395	50	255	330	25	255	395	16	320	460	16	215	265
Michigan	5	220	240	175	150	165	42	335	395	16	335	395	20	335	395	12	335	395			
Minnesota	435	164	194	724	140	165	66	320	370	102	280	330	25	320	370	16	320	370	16	224	264
Mississippi	492	110	190	480	110	110	43	250	355				14	250	340	5	275	400			
Missouri	745	133	172	740	114	133	61	345	400	12	325	360	35	330	385	6	330	410	12	290	340
Montana	407	254	254	228	230	230	34	290	400	40	250	290	5	300	350	4	300	350	11	250	350
Nebraska		190	220		185	185															
Nevada				89	215	225	14	325	365	2	325	365	4	260	350	1	335	335			
New Hampshire	188	172	172	565	153	153	20	221	289	14	221	254	7	221	289	2	294	324			
New Jersey	68	169	312	1048	156	175															
New Mexico																					
New York	590	169	277	3890	160	205		353	436		353	436		353	436		353	436		287	348
North Carolina	2400	100	215	3000	100	145	60	225	390	20	225	375	7	225	425	12	225	425	14	175	350
North Dakota				148	156	195	19	325	350	2	350	350	4	350	350	3	295	350			
Ohio	333	187	332	1521	166	208	51	286	375	58	286	375	46	286	375	12	286	375	7	217	290
Oklahoma																					
Oregon	115	232	232	337	202	202	38	320	400	6	360	440	8	320	384	8	336	384			
Pennsylvania	375	182	182	8500	173	173		213	236		161	241		236	266		354	393		236	266
Rhode Island	10	167	167	258	156	156	2	230	280				1	180	220				1	190	230
South Carolina	200	162	217	1700	108	150	50	200	350	10	185	330	10	200	330	5	300	350			
South Dakota				200	190	210	25	280	325	25	260	325	22	210	440	11	305	440	3	240	270
Tennessee																					
Texas																					
Utah	75	228	266	125	200	208	32	275	295	15	250	275	6	295	345	5	295	345		270	270
Vermont	160	165	175	460	155	175	25	240	312	6	217	280	3	240	292	3	260	292			
Virginia	1483	125	260	1729	114	114	65	260	332	38	201	332	25	201	332	16	201	422			
Washington	300	220	240	340	210	210	53	350	400	10	305	345				18	350	450			
West Virginia	180	162	192	3300	142	142	8	280	350	15	185	235	10	200	315	5	200	350			
Wisconsin																					
Wyoming	137	210	240	139	180	200	30	325	407	26	250	330	3	352	385	8	330	396			

American Association of State Highway Officials

average monthly salary of skilled labor varies from $138.50 to $277.00: common labor varies from $110 to $230; and the salary of state maintenance engineers varies from $370 to $1,045 per month.

The committee recommends further that any study made on a national scale should include such matters as opportunities for advancement, vacations with pay, uniformity in sick leave and in retirement plans. It calls attention to a recent study made by the National Industrial Conference Board, New York, among the employees of six manufacturing companies to determine the five factors that they deemed most important to their morale. Nearly half considered job security as one of these factors. Other factors were: compensation (43 percent), opportunity for advancement (36 percent), type of work (21 percent), the practice of informing employees of their job status (19 percent). The committee found that in only ten states are highway maintenance employees fully provided with job security through civil service: in seven others, a part are so covered, usually the salaried employees.

The joint committee was made up as follows: J. S. Bright (Public Roads Administration), E. A. Collier (Oregon), B. W. Davis (North Carolina), G. B. Finley (Texas), W. Hoenig (Wisconsin), L. F. Johnson (New Hampshire), R. M. Reindollar (Maryland), Ray Robinson (North Dakota), D. N. Stewart (Colorado), C. C. White (Arkansas), and Rex M. Whitton (Missouri).

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Courthouse Design Trends

Some indication of what future courthouses may be like is given by the Federal Courts Building planned for the District of Columbia. To be put under construction early next year, the structure will feature inside courtrooms, private passageways between the judges' chambers and courts, and a message center for jurors, according to Philip B. Fleming, Federal Works Administrator.

W. E. Reynolds, commissioner of the Public Buildings Administration, FWA, whose agency will construct the courthouse, points out that the inside courtrooms will be immune from street noises and will permit better acoustics, lighting and control of air conditioning. Their use, he says, requires less exterior wall area than outside rooms do, and thus, construction and maintenance costs are lower.

Seven stories high, the building will house one of the most active district courts in the United States, the U. S. Court of Appeals for the District of Columbia and functions that ordinarily would be handled by a state court. The building is designed to harmonize architecturally with other Federal buildings on Constitution Ave. The exterior will be faced with Indiana limestone, except that granite will be used below the first floor. Windows will be extruded aluminum and the spandrels between windows will be of black serpentine stone. There will be no cornices or porticos.

To conform to the definite height limits established by the National Capital Park and Planning Commission, the building is designed to provide six or seven courtrooms on each of the three court floors.

The prisoners' elevators and cells are so located with respect to the courtrooms that the handling of prisoners will be both expeditious and safe. The jury rooms are immediately adjacent to the courtrooms they serve, so that the jury can retire from a courtroom to a jury room without passing through any uncontrolled space. The judges can reach any one of several courtrooms from their private offices without passing through any public corridor.

The basement will contain storage and equipment space, the main prisoners' cells, a cafeteria and a garage for about 70 cars.

Deft Material Handling in Limited Area Expedited Erection of Skyscraper

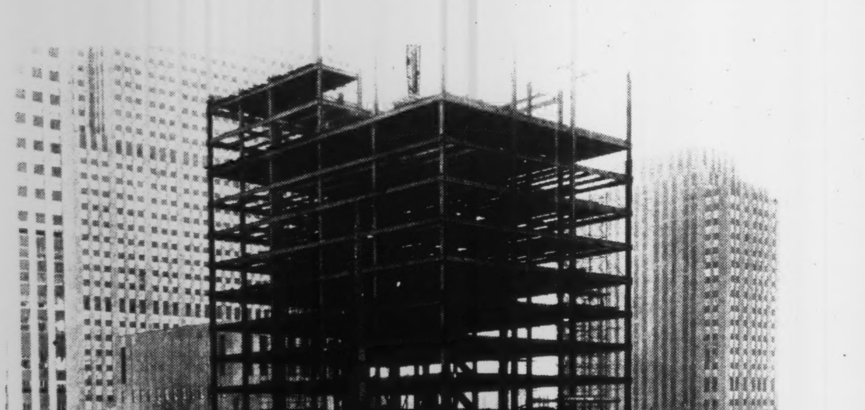
Robert McLean
Vice President in Charge of Construction, John W. Harris Associates, Inc.
New York, N. Y.

DURING A PERIOD of extreme labor and material shortages, erection of the 33-story Esso Building in New York City was accelerated by skillful handling of building materials and equipment. Handicaps—particularly lack of adequate storage space at the site—were overcome by scheduling operations well in advance.

Months before construction operations began, the contractor and the owner's engineers held conferences to plan the job. Complex schedules were set up, day-to-day coordination techniques were worked out, and an overall plan for materials handling, storage and distribution was detailed.

Here are some of the considerations that influenced the planning:

1. Scarcity of building materials, a factor that made it necessary to buy materials in an unpredictable market in which no set delivery schedules could be followed.
2. Lack of storage space near the site. This made it difficult to stockpile appreciable amounts of materials until forms were stripped on the lower floors of the structure.
3. Heavy traffic conditions on adjoining streets. This influenced the entire materials-receiving pattern at the site.
4. The unusually large quantities of mechanical equipment that went into the building, a large part of which was required for the air conditioning system.
5. Uncertainty of the labor supply—both qualitatively and quantitatively.



STEEL FOR THE 33-STORY ESSO BUILDING was erected by a derrick that rose with the frame and a relay derrick on the 10th floor setback.

Rockefeller Center addition

The Esso Building is a T-shaped skyscraper at the north end of Rockefeller Plaza. It has a frontage of 100 ft. on West 51st St. and 274 ft. on West 52nd St., between Fifth Avenue and the Avenue of the Americas. It occupies 37,500 sq. ft. of ground area and forms the northern gateway to Rockefeller Center. Without setbacks a central tower, 90x127 ft. in plan, rises above the 10-story level of the T, to a height of 424 ft.

The building has a structural steel frame. Walls have limestone facings, backed up with brick. Spandrels are cast aluminum. Floors are reinforced concrete.

Housing such diverse facilities as a mammoth four-level restaurant, one of New York's largest branch banks, an auditorium and maintenance and shop areas, the edifice incloses about eight acres of rentable office space.

It is the tallest fully air-conditioned building in the world.

The design of the Esso Building made advisable division of the materials-handling problem into two separate parts, as though two structures were involved. The first was delineated as the lower, T-shaped, ten-story section; the second was the 23-story tower, which is superimposed on the T.

There was still another building that had to be considered—the adjoining Chemical Bank & Trust Co., on 51st St. Two stories were to be added and the interior extensively altered.

To facilitate materials handling, arrangements were made for the use of a 100 x 100-ft. vacant area on 52nd St., opposite the site. Subsequently, a house on 53rd St. on the west side of this lot, was obtained for office purposes. In it was installed administrative personnel, a well-equipped first aid section and a large drafting room for mechanical engineers. On addition of a 20-ft. wide strip of ground, the office forces were given easy access to the job site.

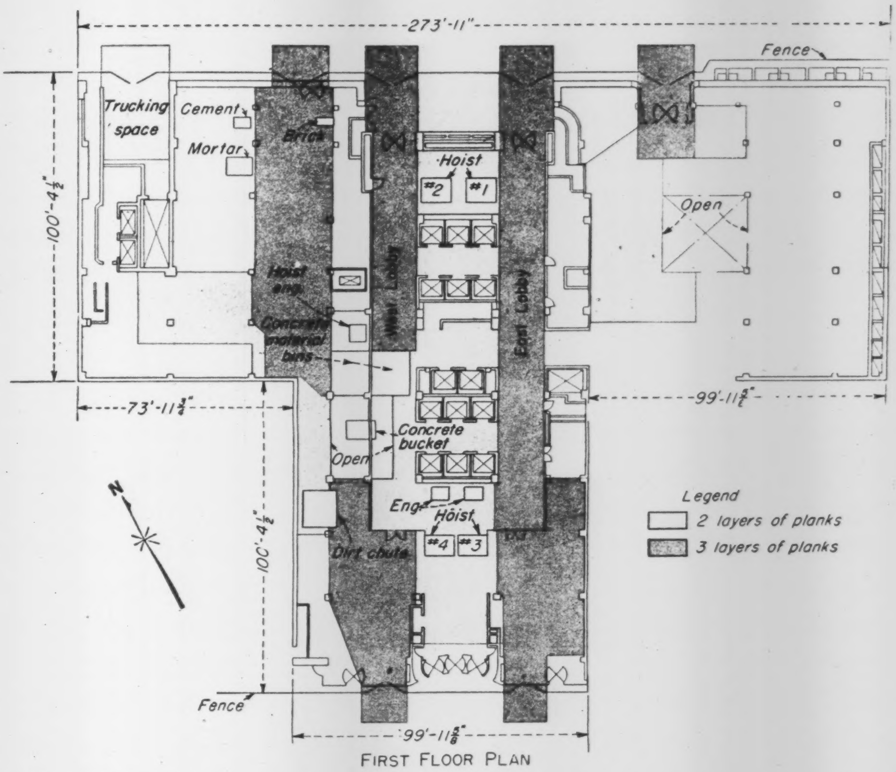
The lots also provided space for storage and pipe-cutting operations. Sheds were built to store small fittings, motors and other items of mechanical equipment, and separate pipe-cutting shops were set up for plumbers, steamfitters and electricians, adjacent to their pipe-storage racks.

Tenant removal held up job

The first major phase of the project consisted of demolition of existing buildings on the site, most of them old brownstone homes. Because of slow tenant removal, this activity consumed nine months and delayed the progress of other operations.

Actual excavation was routine, except where variable rock conditions required special shoring and where the irregular demolition program interfered. During the early stages of excavation, trucks drove onto the site to receive rock directly from power shovels. Access was provided as long as possible by an earth ramp. Later, a 190-ft. timber ramp was extended from the street level on 51st St. to the bottom of the excavation 39 ft. below. The new ramp facilitated excavation of the earth ramp and enabled efficient operation of the power shovel for a longer period of time.

The materials-handling system that operated throughout the course of the project was called into being soon after forms were stripped for the subcellar, cellar and first floor of the T-shaped building. These floors served as principal storage areas and distribution centers for the entire construction program. Materials used for the addition of the two extra stories on the Chemical Bank Building were stored on the second and third floors of the Esso Building, adjacent to work areas.



FIRST FLOOR PLAN

THE FIRST FLOOR was the main materials distribution center. To prevent damage to the concrete slab, it was covered with timber planks.

A number of steps were taken as precautionary measures against overloading. Before concrete was poured in lower-floor storage areas, the amount of reinforcing mesh normally required for safe loading was doubled. Also, prior to the receipt of materials for storage, these areas were double planked, and timbers were extended through both cellars to the ground to support beams and slabs in areas carrying extra heavy loads.

A planked driveway extending from 51st to 52nd St. was then built in the east portion of the street floor for one-way traffic, as indicated in the accompanying diagram. This allowed trucks to unload off the busy thoroughfares and closer to storage areas within the building.

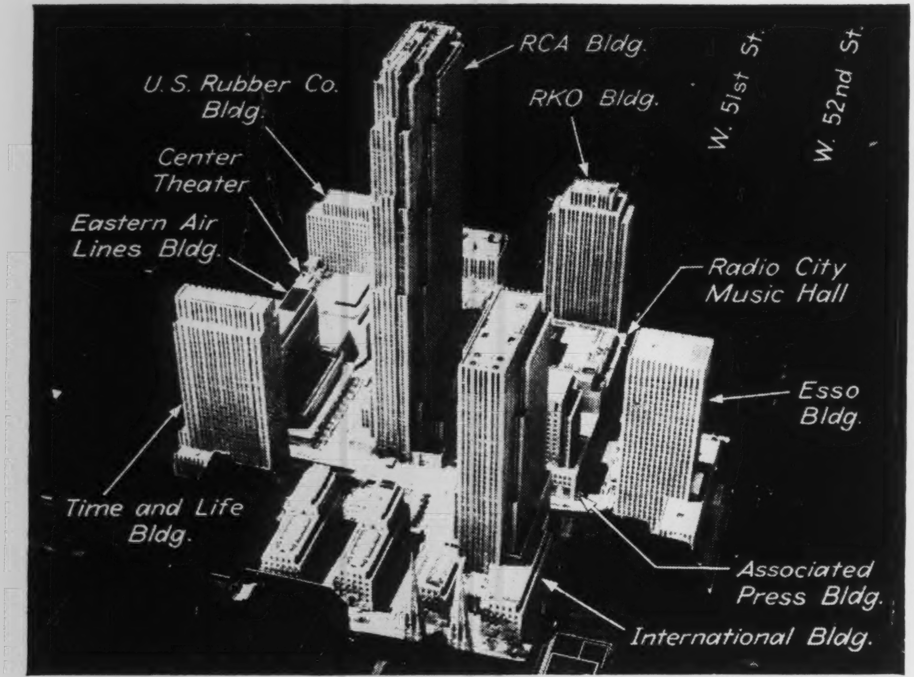
Another access passage for trucks was located on the west side of the building. Trucks thus could approach the west passage from both 51st and 52nd St., but it was never considered necessary to make this runway a through passage. It was used for two principal purposes—to receive cement and aggregates and to remove waste.

The 52nd St. entrance was used for delivery of grit, sand and cement midway in the building. Heavy trucks dumped directly into the storage hoppers.

Immediately south of the bins—in the cellar and subcellar—was a 1-cu. yd. electrically-driven mixer, which dumped into a bucket hoist for distribution throughout the T building and tower. To permit operation of this special hoist during the entire construction program, a panel of the steel framing was kept open from subcellar to roof.

Waste removal

The 51st St. side of the west runway was used for dirt and waste removal. This operation was facilitated by the use of a tubular steel chute running the height of the building with window outlets at each floor. The chute emptied into a wooden hopper on the mezzanine above the



Thomas Airviews Photo

ROCKEFELLER CENTER, a 15-building commercial development occupying more than 12 acres in crowded midtown Manhattan, left little space for construction activities on its newest structure—the Esso Building.

first floor, and the hopper, in turn, dumped directly into trucks. A 2-in. water line, to allay dust and fire, was provided with the hopper.

A third entrance and planked runway was installed near the west end of the building for the almost exclusive use of the mason contractors. At one side of this runway, at cellar level, a large storage bin for mortar was constructed. Materials were fed horizontally by a screw-type conveyor into a mortar mixer, from which wheelbarrows delivered to a nearby materials hoist on the north side of the building.

Brick was dumped on the cellar floor near this hoist. For this purpose, a 4x6-ft. opening was left in the first floor.

A large part of the east wing of the first floor was planked for the storage of heavy equipment required for the various mechanical services in the cellar and subcellar of the building. Storage in this part of the structure, however, was somewhat limited because of a large open machine room with a two-story ceiling height, extending from under the first floor down to the subcellar. This ceiling height made it difficult to brace the first-floor slab in this area.

Directly above this two story machine room, a full bay was left open to permit lowering two large refrigeration units—one with 700 tons capacity, the other 800 tons—many pumps, ejectors, valves and other mechanical equipment. The open bay also contained a chute to transport various building materials to cellar level for storage. When the last of the heavy equipment arrived, the open bay was closed and work in that area proceeded in regular routine.

A large quantity of piping was also stored in this east portion of the main floor. Since the piping was of especially long lengths, reaching from girder to girder, floor strengthening was simplified. This piping was used for various purposes on the first floor and below, where most of the mechanical services centered.

High crosshead hoists needed

At the outset of the job, four hoists of 3-wheelbarrow capacity were installed. Two were provided with crossheads 10 ft. above their platforms, rather than the usual 5 ft., to accommodate the unusually long lengths of pipe and ductwork required in the building. One 10-ft. head and one 5-ft. head hoist were located on the north and south sides of the building.

As steel went up, the hoist towers were raised so that materials for steam and plumbing risers, air conditioning and other services could be placed on floors well ahead of wall construction. These materials went into place shortly after the stripping of concrete arches, and delay in delivery of any material to the various floors would have caused a bottleneck.

Derricks placed steel, raised pipes

About 8,500 tons of structural steel were required in the construction of the building. To erect the frame for the 10-story T-shape portion, four derricks were used. For the tower, a relay derrick was located on the 10th-floor roof and it was supplemented by another derrick that followed the structure upward. The relay derrick took steel from trucks on 52nd St. and deposited it on the 10th-floor setback in a position where the tower derrick could pick it up.

The derricks were also used to raise the great quantities of piping required for the air conditioning system and for plumbing and steam risers. Stored on the steel framing every few floors, the piping was later lowered into place as required. In the construction of the T building, most of the pipe was placed on the 10th floor setback and lowered into position.

Wall erection standardized

A standard procedure for wall construction was established at the beginning of the job and continued until completion. The cycle started as soon as concrete forms were stripped for a floor. Cast aluminum spandrels were placed, followed by setting of the limestone facing and the backing of sand-lime brick up to sill height. Window frames were then installed, thus allowing the limestone facing and brick backing to be built between windows to the next floor level.

The spandrels were always two stories ahead of the stone. Stored in the lower part of the building, they were hoisted when needed to the point of installation and were attached to the spandrel beam by a triangular gusset plate and clip angle.

The limestone was transported by truck to the curb alongside the building and raised by the stonemen's own derrick to the sidewalk bridge and the second floor setback. Delivered cut to size, the blocks were sorted before distribution to the upper floors. They were raised to the level two floors above the work area by a Chicago boom attached to a corner column, later supplemented by an A-frame derrick on the top roof. Then the stones were lowered individually by portable-type cantilever derricks to the masons who set them from outside scaffolds.

Temporary elevator hoisted workers

Another important part of the project was the transportation and distribution of workmen, who numbered about 900 at peak employment. This problem did not become acute until the concrete archwork reached the 10th floor, because stairways could be used until that point. After that, a temporary elevator for passengers only was installed in one of the building's permanent elevator shafts, with a motor room on the 13th floor.

As the structure approached the 23rd floor, the motor installation was dismantled and raised ten stories to permit passenger traffic to the 21st floor. The temporary elevator was not raised again because one of the permanent elevator cars was rushed to completion shortly after steel work was topped out. After the temporary elevator was removed, permanent work in the shaft it had occupied was speeded up to reach the status of adjacent shafts.

Carson and Lundin were architects for the Esso Building, with Wallace K. Harrison as consulting architect, Edwards and Hjorth were structural engineers and Pollock and Grieve mechanical engineers. Steel was erected by Bethlehem Steel Co. General contractor was John W. Harris Associates, Inc., with Harold Von der Fehr superintendent of construction. Architects for the addition to the Chemical Bank & Trust Co. were Walker and Poor.

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Storm-Drain Design Shortcomings Under Scrutiny in Maryland

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WIDE VARIATION in the bases of design for storm drainage systems, submitted for review to the Maryland state board of health, reveal the need for coordinated action in the interest of uniformity and consistency.

In the past, designs for complete or partial systems have employed rainfall-intensity rates with variations of as much as 100 percent—namely, 2 to 4 in. per hour. Coefficients of runoff have been used with variations ranging from 1.00 to 0.05, the former for densely built-up impervious areas and the latter for undeveloped or sparsely settled areas where surface soils are primarily sand and loam.

City-county differences

Variations in design, though recognized in the past, became more apparent last year. A case in point is that relating to Baltimore city and the contiguous Baltimore County Metropolitan District.

Some forty years ago Baltimore city embarked upon a program of installing separate sanitary sewers and storm drains. The only local rainfall records available were from a single gaging station which was installed in 1897. A comparison of local records was made with those of Boston, Philadelphia, St. Louis and Washington, D. C., before selecting a rainfall-intensity curve. As selected, it did not envelop the major storms; only the average higher ones were included. The rational method of design was chosen, the rainfall-intensity represented by the formula: $i = 105 \div t + 10$. This basis was used for a number of years and was eventually replaced by the McMath formula or method. The latter continued in use until early 1948.

The Baltimore County Metropolitan District, created in 1924, literally had no basis of design for storm drains until several years ago. Then, the rational method was adopted and continues to be used. Concurrently the McMath method was used in city and the rational method in the county.

As a result, the state department of health was called upon to review and approve storm drains designed for the upper portion of a drainage basin in the county using one basis of design and the continuation of these drains in the downstream city portion of the same basin designed by another method.

The two methods, by sheer coincidence, agree at times. But the number of coincidences, as may be expected, are too infrequent. Actually we faced the problem of approving drains with discharge values higher than those into which they emptied. State health department personnel can be resourceful, but we were at a loss for a procedure akin to that of pouring a quart of water into a pint bottle with no spillage and none left over.

Shortcomings revealed

To cope with this difficulty, a conference of city and county engineers was called by George L. Hall, chief engineer of the state health department. The committee assigned to study the problem not only reviewed the discrepancies resulting from the two methods of design, but also gave thought to other shortcomings of design so characteristic of modern practice.

Specifically, these shortcomings relate to determination of the factors of rainfall intensity and coefficient of run-off. It is unfortunate, but true, that too little is known about them, taken independently and as interrelated.

It was also recognized that too little is known about inlet capacities and their spacing, rates of runoff from the various natural and artificial surfaces, the effects of ponding and how to provide for changes in surfaces brought about by industrial and commercial encroachment on partially or completely drained residential areas. The committee, however, confined its review to rainfall intensity and coefficient of run-off factors.

More records needed

Considering all of the variables and uncertainties involved, it is amazing that vast sums of money are expended each year on storm drains and so little effort made to obtain more comprehensive basic design data.

For example, rainfall records in the Baltimore area were obtained, until a few years ago, from a single station established in 1897. A second station, four miles from the original one was placed in service in 1935.

Rainfall recorded automatically

The older rainfall stations in this country were provided to record total rainfall per day, week, month and year. They were not planned or strategically located to be of maximum value for storm-drain design. Today, a majority of rainfall stations are of the automatic type, recording rainfall intensities with respect to time. The years of such records are comparatively short, and it is the practice to compare and sometimes qualify local results with records of other nearby cities equally as deficient in rainfall station coverage.

From the data obtained at the automatic recording stations it is the practice to arrange the records in an array according to their magnitude, using time as the abscissas and intensity as ordinates. Curve lines are passed through or used to envelop the points for all the storms and referred to as rainfall intensity curves designating the storm that may occur once in 5, 10, 20, etc., years.

To a large extent omission is made of the fact that many of the records of storms represent only partial rates and are not, therefore, truly representative. In other words, maximum intensities are compared to partial ones and are given the same weight or numerical value in the array. The curves for storms of various frequencies are always of the hyperbolic or drop-down type, indicating less intense rates as the time factors increase.

Storm intensity may not drop

Such deductions are valid with respect to a fixed point such as a rainfall station but ignore the probability that storms can and do move parallel to the main artery of a drainage system and may not decrease, therefore, in intensity with time or in proportion to the time of flow in the drains. In other words, the time of flow from one section of a drain to the next lower section does not govern rainfall rates. Only complete rainfall station coverage will eliminate such errors of deduction.

For example, on June 19, 1948, one thunderstorm in Baltimore had five centers of maximum rainfall but at the city's old downtown station the rainfall was only nominal. With adequate station coverage we should have records of five maximum rates instead of a single partial one. Actually flooded conditions obtained but if the official records were to be presented in court the official data could not verify this fact.

To further support the committee's work a review was made of the comprehensive study by the U. S. Weather Bureau during the past five years entitled: "Hydrometeorological Report No. 5. Thunderstorm Rainfall. Parts 1 and 2." This report makes it clear that too much dependence cannot be placed on the records of a single rainfall station. One station per five square miles appears necessary for complete coverage. The report also discloses significant data concerning the shape, coverage, rates of travel and other phenomena of thunderstorms pertinent to storm-drain design.

Coefficient-of-runoff

What proportion of a rainfall runs off from various surfaces to be intercepted by storm-water inlets eventually to reach the drain is generally designated as the coefficient of runoff. Far too little is known about this factor.

There are many generalities concerning its relationship to rainfall intensity, but these data are more doubtful than precise. We need more actual accurate measurements of runoffs from precisely surveyed areas, synchronized as to time with automatic rainfall gage records on the same drainage areas.

Thus after a number of typical areas have been calibrated we would have a far better knowledge of runoff coefficients and not continue to use previous values stepped up or down guided more or less by the frequency of flood damage. Incidentally, as time progresses in acquiring such data we would also be able to study the influence of previous storms upon the values of the coefficient. At present there appears to be a complete absence of such information, although it is realized that previous storms do saturate reasonably pervious surfaces and increase their runoff for a subsequent storm.

Recommendations advanced

The committee suggested, therefore that:

1. A program be established to install automatic rainfall gages, uniformly spaced at 5-mi. intervals.
2. Construct storm-drain automatic measuring devices on a number of typical areas more or less completely developed, provided with existing drains and for which all surface classifications could be measured and tabulated with accuracy. By combining the hydraulic characteristics of the drains with velocity and depth measurements, values of discharge would be calculated and in turn those for coefficient of runoff determined.
3. Correlate the data for each typical drainage area, synchronized as to time, to determine the interrelationship of rainfall intensity and coefficient of runoff.

The efforts of the committee have been fruitful because an initial move has been made to carry out its recommendations, at least in part. Meantime, additional research has been inspired in Washington, D. C., and in the Washington Suburban Sanitary District, an area of 198 square miles next to the District of Columbia.

Members of the committee were Bernard F. Suwall and William S. Staylor of the Bureau of Sewers of Baltimore City, Roger T. Powers, of the Baltimore County Metropolitan District, and the author, who served as chairman.

* * *

More Concrete Homes

One reaction to high lumber prices is a great increase in percentage of homes built of concrete even in lumber-producing regions. In California, for example, both precast blocks and monolithic concrete are being much more extensively used for private homes and on housing projects. This situation encourages development of and creates opportunity for a complete line of equipment and materials. Forms for cast-in-place houses can be rented for $30 per room; greater strength is being developed in lightweight concrete; attractive finishes, new prefab, ideas and ingenious reinforcing schemes are springing up. A quick survey shows that in southern California more than 10,600 concrete homes (masonry block and cast-in-place) are now under way or were completed within the past 12 months.

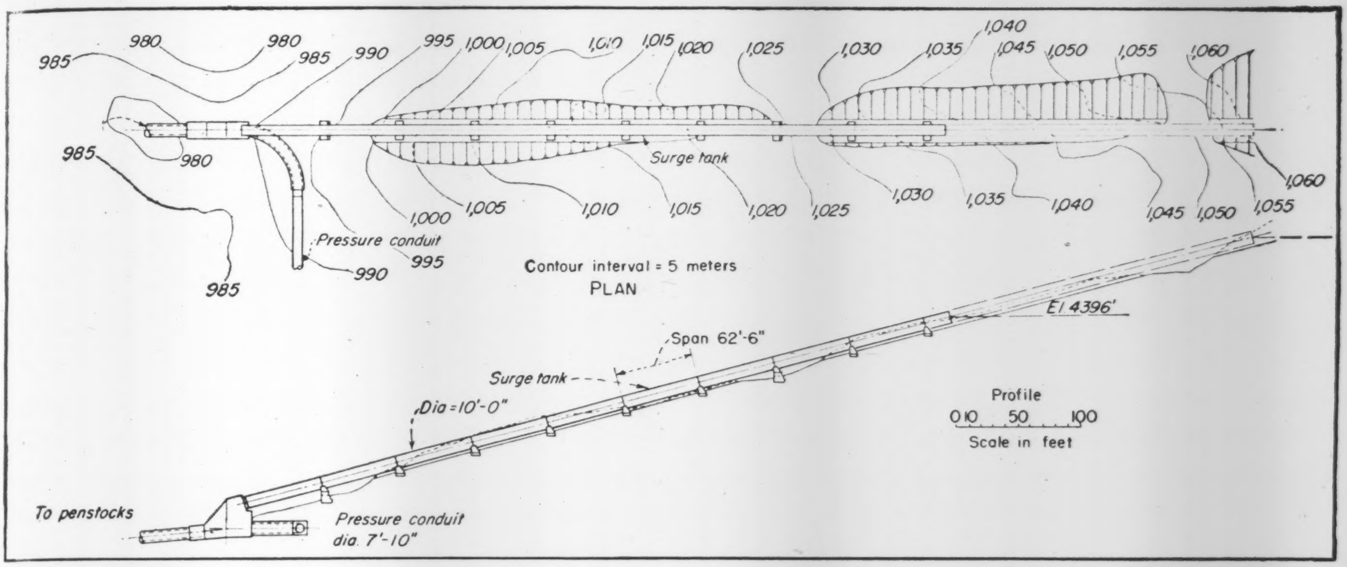


FIG. 1. **AN INCLINED SURGE TANK** at right angles to the pressure conduit and lying close to the slope was used at La Insula instead of the conventional vertical tank. Pressure conduit elevation is 4237 ft.

Sloping Surge Tank Designed To Resist Earthquake Forces

H. Alden Foster
Principal Associate, Parsons, Brinckerhoff, Hall & MacDonald,
New York, N. Y.

FOREMOST among the problems put up to designers of the Caldas hydroelectric plant in Colombia, South America, was that of providing a surge tank for the power plant that would be reasonably safe against damage by earthquake shocks, as the plant is located in an active earthquake zone.

The Caldas project is being built by La Central Hidroelectrica de Caldas, which is a public corporation, shareholders being the Colombian government, the Department of Caldas and several municipalities now served by small, inadequate, antiquated water power plants. A study of the potential power resources of the department—a mountainous region—indicated the resources of the tributaries of the Cauca, the principal river, would have to be developed first. The current growth of power demand did not warrant development of the larger stream at this time.

The current work is on two of the tributaries, water from the upper reaches of the Chinchiná River being diverted by a small dam through an open canal, reservoir, tunnel and pressure conduit into the valley of the Campoalegre River where a maximum head of 393 ft. will be developed initially in La Insula plant. Ultimately, the head on this plant will be increased by raising the height of the dam forming the reservoir by 65 ft. The head remaining between La Insula and the Cauca River will be developed by a plant located near the mouth of the Campoalegre River.

Details of the plant

La Insula plant is supplied with water from the Cama-de-Guadua reservoir by a concrete-lined pressure tunnel, 8.2 ft. in diameter and 6,725 ft. long; and a steel pressure-conduit with average diameter of 8.2 ft. and 2,900 ft. in length. The total distance from the reservoir to the surge tank is, therefore, 9,625 ft. The reservoir is designed for ultimate spillway crest at El. 4400 above sea-level; maximum drawdown will be 85 ft., and the maximum discharge through the conduit with three units operating in the power house will be 730 cfs.

Two types of tank studied

A preliminary hydraulic analysis showed that either a simple or differential type of tank would satisfy the requirements of design, the differential tank having a total height about 25 ft. less than required for a simple tank.

The cost of the two types appeared about the same, on account of the additional expense for the riser pipe of the differential tank. Due to the 85 ft. drawdown in the reservoir, at least that much of the height would be required regardless of the type or diameter of the tank.

The studies showed further that a tank with diameter of 6.0 meters (19.7 ft.) would be sufficient to provide hydraulic stability. However, in order to reduce the total height as much as possible, and thus increase the stability against overturning forces, the differential tank was ten-

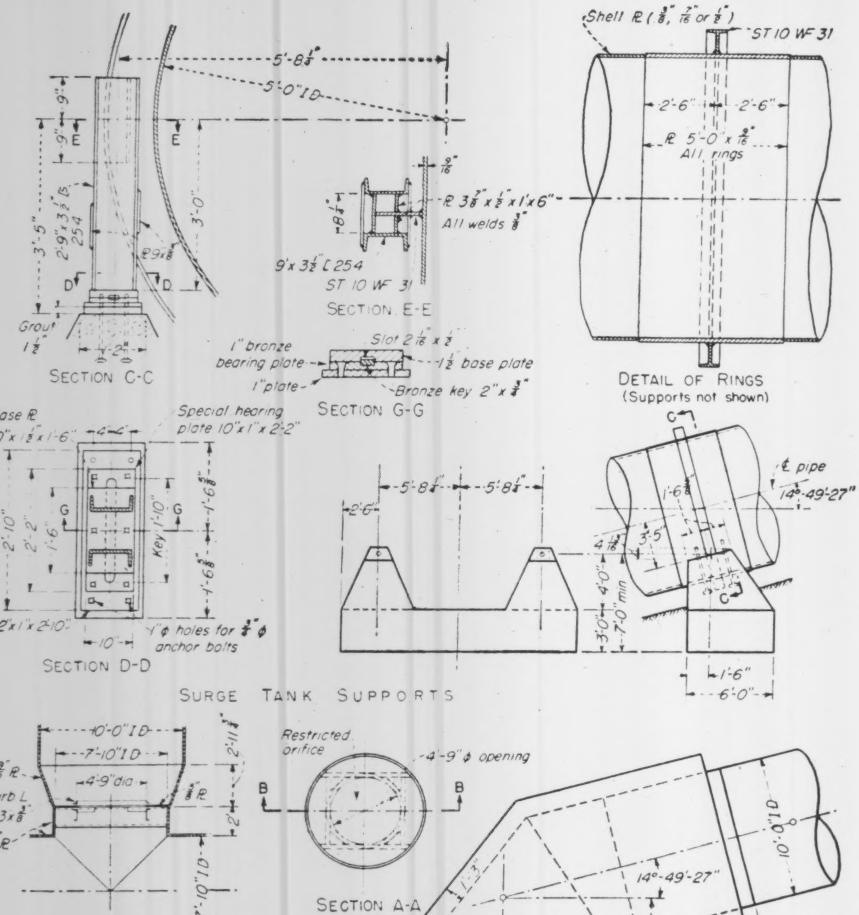

5'-8¼"
5'-0" I.D.
9"
E
3'-5"
2'-9" x 3½" [
254
3'-0"
℞ 9 x ⅜
D
Grout
1½
2"
SECTION C-C
9/16"
8¼"
℞ 3⅞" x ½" x 1'x6"
All welds ⅜"
9'x 3½" [254
ST 10 WF 31
SECTION E-E
Slot 2 1/16" x ½
1" bronze bearing plate
1½ base plate
1" plate
Bronze key 2" x ¾"
SECTION G-G
Shell ℞ (⅜", 7/16" or ½")
ST 10 WF 31
2'-6"
℞ 5'-0" x 9/16"
All rings
DETAIL OF RINGS
(Supports not shown)
Base ℞ 10" x 1½" x 1'-6"
4"
Special hearing plate 10" x 1" x 2'-2"
2'-10"
2'-2"
1'-6"
G
Key 1'-10"
1'-6⅜"
℞ 12"x 1" x 2'-10"
1" ϕ holes for ¾" ϕ anchor bolts
10"
SECTION D-D
2'-6"
5'-8¼"
4'-0"
3'-0"
7'-0" min
C
℄ pipe
14°-49'-27"
1'-6⅜"
3'-5"
4 13/16"
1'-6"
6'-0"
SURGE TANK SUPPORTS
10'-0" I.D.
7'-10" I.D.
4'-9" dia
9/16" ℞
Curb L 3x3x⅜
½" ℞
2'-11¾"
⅜" ℞
2'
7'-10" I.D.
SECTION B-B
Restricted orifice
4'-9" ϕ opening
B
SECTION A-A
1:3
14°-49'-27"
10'-0" I.D.
½" plate
9/16" shell
10'-0" I.D.
A
17'-4¾"
7'-10" I.D.
20'-1½"
CONNECTION OF SURGE TANK TO PRESSURE CONDUIT

FIG. 2. A RESTRICTED-ORIFICE TYPE OF SURGE TANK made possible a reduction in cost through elimination of the internal riser pipe.

tatively adopted, with interior diameter of 8.50 m. (27.9 ft.) and total height of about 175 ft.

Due to the height required for the tank, it was realized that a considerable saving in cost could be obtained if the riser pipe of the differential tank were omitted. This could be accomplished by using a "restricted-orifice" design instead of the differential type of tank. A comparative study of these two types showed that, with the same effective size (8.5 m. diam.), the orifice tank would only have to be 6 ft. higher than the differential tank. Accordingly, the restricted-orifice type was adopted for final design.

Earthquake forces considered

In the preliminary studies, it had been assumed that the surge tank would be constructed in a vertical position, with the lower portion located below ground level. The Caldas project is located in an active earthquake area and it had been decided to design all structures to be safe against an earthquake acceleration of one-eighth gravity. The diameter of the vertical surge tank as selected was somewhat greater than actually required for hydraulic stability, in order to reduce its slenderness ratio and give greater resistance to overturning forces. In spite of this, it was found that a design capable of withstanding the assumed earthquake force would require either an excessively wide base or would result in very high soil pressures under the foundation.

At the site of the tank there is no sound rock available for foundation purposes, as bed rock is at a considerable depth below the ground surface. The overlying material is mostly clay, and can not be relied on to carry heavy loadings. Under these conditions, it was realized that a vertical tank of the required height would be impracticable.

A sloping surge tank

While it is usual practice to construct surge tanks in a vertical position, this is not necessary for hydraulic requirements. Surge chambers have frequently been constructed in a sloping position and of various shapes where it is possible to excavate for them in solid rock. For the Caldas project, it was decided to use a sloping tank, but to place it above ground in the form of a steel pipe extending up the hillside and approximately parallel to the existing ground surface.

It is believed that this arrangement is rather unusual in surge tank design practice. By using a "lying-down" tank, the principal foundation difficulties were completely eliminated since the tank could be carried on numerous supports instead of on a single base, and the overturning moments caused by earthquake would be reduced to relatively small values.

By using a sloping tank, the question of slenderness would no longer be of interest in the structural design. Accordingly, it was decided to design the sloping tank to be equivalent to a vertical tank of 6.0 m. (19.7 ft.) diameter, instead of the 8.50 m. diameter used for the vertical tank studies. Due to the smaller area of water surface as compared with the 8.5 meter vertical tank, the required vertical height was increased to about 200 ft.

The actual diameter of the sloping tank would be less than 6.0 m. since for hydraulic purposes it was only necessary to have the same area of free water surface at all elevations in order to make the sloping tank equivalent to a vertical tank.

The relationships between a vertical and sloping tank were determined as follows:

Let D = diameter of equivalent vertical tank.

D_1 = diameter of sloping tank.

A = angle of slope of the tank with respect to the horizontal.

Then the minor axis of the elliptical horizontal water surface will be D_1: the major axis will be $D_1/\sin A$. Therefore, for equivalent areas,

$$\frac{\pi D^2}{4} = \frac{\pi D_1}{4} \times \frac{D_1}{\sin A} \text{ and } D_1 = D\sqrt{\sin A}$$

If H = total height of the vertical tank,
and L = total length of the sloping tank,
$L \doteq H \sin A$.
If t = thickness of shell of the vertical tank at any elevation,
and t_1 = thickness of shell of the sloping tank at the same elevation,

then $\frac{t_1}{t} = \frac{D_1}{D}$, theoretically, so far as the bursting stresses are concerned.

Let W = total weight of steel in the shell of the vertical tank, for theoretical design,
and W_1 = total theoretical weight of steel in sloping tank.

$$\text{Then } \frac{W_1}{W} = \frac{t_1 D_1 L}{t D H} = \frac{D_2 L}{D_2 H} =$$

$$\frac{D_2 \sin A}{D_2} \cdot \frac{H}{\sin A} \times \frac{1}{H} = 1.0$$

Therefore, the theoretical weight of steel in the sloping tank is the same as that required for the vertical tank, when the shell stresses due to water pressure only are considered.

For the Caldas surge tank, A = 14°-45′. With D = 19.7 ft., the diameter of the sloping tank was equal to $19.7\sqrt{.255}$ or 10 ft. The "restricted orifice" was computed as requiring a diameter of 4.75 ft. Details of the connection between the surge tank and the pressure conduit are shown in Fig. 2, which also indicates the construction of the diaphragm containing the orifice.

Design methods employed

The sloping portion of the tank was designed as a steel pipe with ring-girder supports, so as to permit the use of relatively long spans. Analysis of stresses in the ring-girders and pipe shell was based on the theory developed by Herman Schorer "Design of Large Pipe Lines," *Transactions*, ASCE, Vol. 98, 1933, p. 101). Span length was established as 62.5 ft. measured parallel to the axis of the pipe.

The supporting posts were rigidly attached to the stiffening rings, normal to the axis. Sliding contacts between the posts and the footings permit longitudinal expansion by the use of self-lubricating bronze bearing plates containing holes in which a special lubricating material is inserted.

A plan and profile of the surge tank are given in Fig. 1, and details of the ring-girder supports are shown in Fig. 2.

Loads due to earthquakes

Mr. Schorer's analysis does not cover the condition of transverse loads such as would be applied at the pipe supports under earthquake acceleration. Consequently, with the cooperation of Sergey Steuerman, the method proposed by Mr. Schorer was extended by the writer to include the forces caused by earthquakes.

That analysis showed that the unit-stress in the ring-girder at the supports resulting from the earthquake acceleration of $\frac{1}{8}$ gravity amounted to about 30 percent of the stress at the same point due to vertical loads only. As conservative design stresses had been used for the vertical loads, it was not considered necessary to increase the dimensions of the ring-girder for earthquake conditions. However, the supporting posts had to be designed to carry the full bending stresses due to cantilever action under the transverse earthquake loading.

(Details of the method of determining the effect of earthquake faces on a pipe line with ring-girder supports developed by Messrs. Foster and Steuerman are available on request. —*Editor*)

The firm of Parsons, Brinckerhoff, Hogan and MacDonald, New York, was engaged by the Central Hidroelectrica to review the studies it had made and prepare construction plans for the most economical plan of development. The hydraulic and structural design of the surge tank for La Insula plant was carried out under the direction of the writer. Arturo Botero H. of Manizales, Colombia, assisted in the hydraulic analysis; he should also be credited with making the original suggestion of using a sloping instead of a vertical tank.

Construction of certain portions of the Caldas project, including the diversion dam and canal, is being carried out by La Central Hidroelectrica with its own forces, under the direction of Arturo Montes S., general manager. The pipe lines, surge tank, penstocks and power house are now being constructed by Christiani & Nielsen, Ltda., Bogata, with Paul Jorgensen as engineer-in-charge.

Side-Lighted Moving Stairs In Department Store

An installation of twelve escalators in the Rike-Kumler Co. department store at Dayton, Ohio, utilizes an illuminated balustrade in an attempt to improve upon the usual overhead method of lighting. The interior paneling of the balustrade is made of frosted, translucent, high-strength glass, which was bent and joined with transparent plastic strips. Behind the panels are continuous rows of cold-cathode tubes with full-height reflectors.

Providing vertical transportation from the basement to the sixth floor, the moving stairs are 4 ft. wide and have a capacity of 8,000 people per hour.

The lighting design was by Eleanor Le Maire of New York City and the installation by Otis Elevator Co. Frank Messer & Sons, Inc., Cincinnati, Ohio, was the general contractor for pertinent structural changes.

MOVING STAIRS in a Dayton, Ohio, department store are lighted by illuminated balustrades.

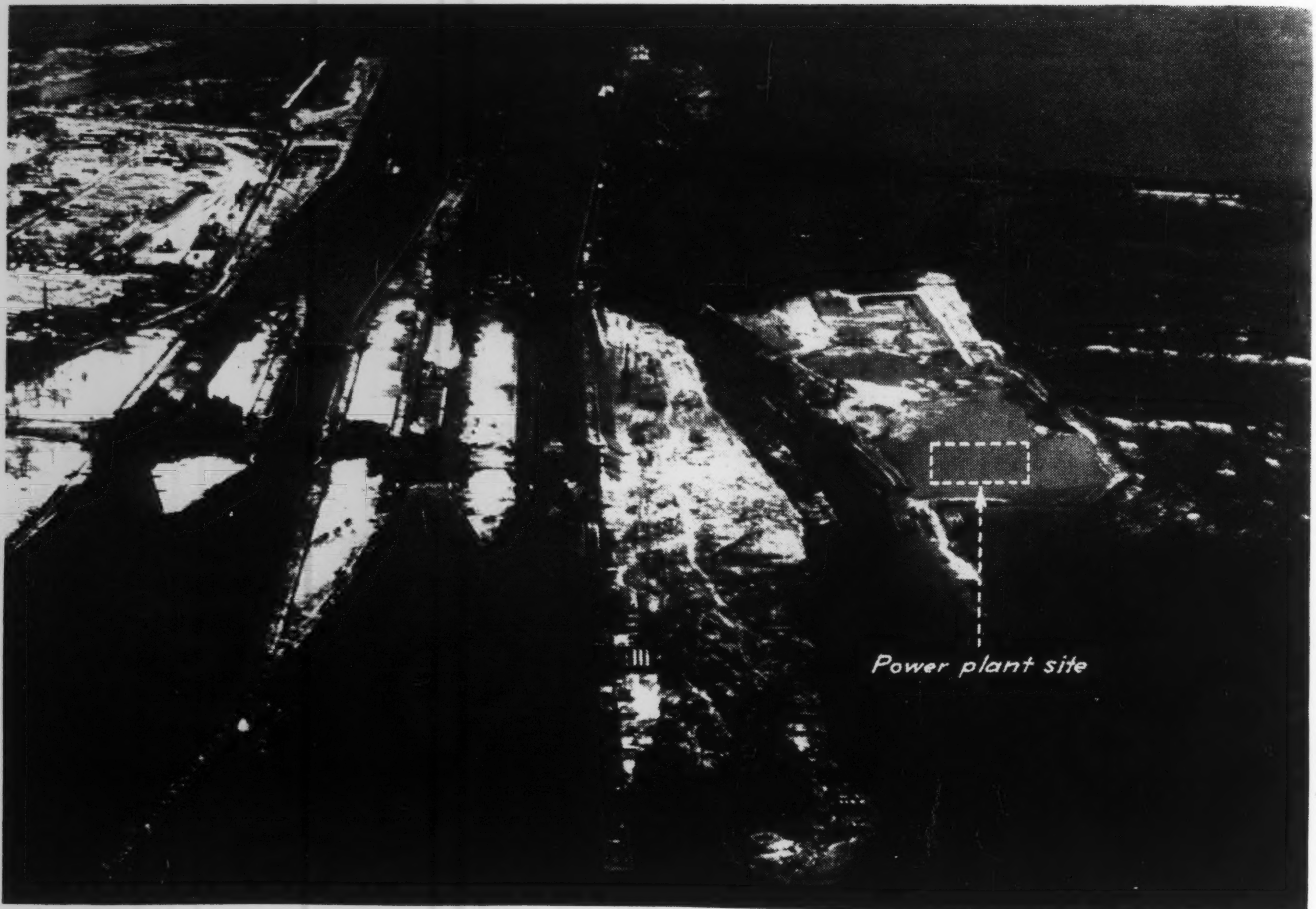


Photo by Elmer Eckroad, Sault Ste. Marie, Mich.

NEW POWER PLANT at Sault Ste. Marie, Mich. required . . .

Big Cofferdam Built in Turbulent Rapids

THREE separate rock barriers will have been built between the rapids at Sault Ste. Marie, Mich., and the new power plant being constructed in the St. Marys River, by the time the project is completed. The first barrier was a work dike along the north and east sides of the site connecting with the old headrace above and the tailrace below. Next, the cofferdam proper was built inside the work dike and, subsequently, the north raceway dikes will be built inside the cofferdam.

The new powerhouse will be located opposite the lower end of the Sabin Lock. The 16-acre site, measuring roughly 1,800x400 ft. parallels the Sabin Lock, with about 500 ft. separating the site and the lock.

When completed in 1951, the new power plant, with its total capacity of 18,500-kva., will replace the existing 40-year old, 5,000-kva. plant which for some time has been inadequate in capacity, with high maintenance costs. Electric power from the new plant, in excess of a relatively small amount needed to operate the locks, will be sold to Sault Ste. Marie, to industrial and rural consumers in that area and as far south as Mackinac Island. Decision has not been made to date whether the government will lease the new plant to the Edison Sault Electric Co.—current lessors of the existing plant—or operate it and sell power at the busbar.

Securing a toe-hold in the rapids

The most spectacular feature of the entire cofferdam and excavation contract was the manner in which the contractor secured a veritable "toehold" in the rapids at the start of the job. Since the only access to the site was by barge up the old tailrace, the contractor moved in four shallow-draft steel barges and a small tugboat formerly used on Mississippi River construction. Using a barge-mounted dragline, he leveled off a working area on the old tailrace dike to establish construction headquarters and to land a power shovel and three end-dump trucks.

Borrowing rock excavation from the top of the old dike he built a temporary work road angling upstream-away from the dike and about 600 ft. out into the rapids to a point on the north line of the construction site. The current was swift, and much of the excavated material from the old dike was lost. But eventually the road was completed, lying partly above and partly below water level.

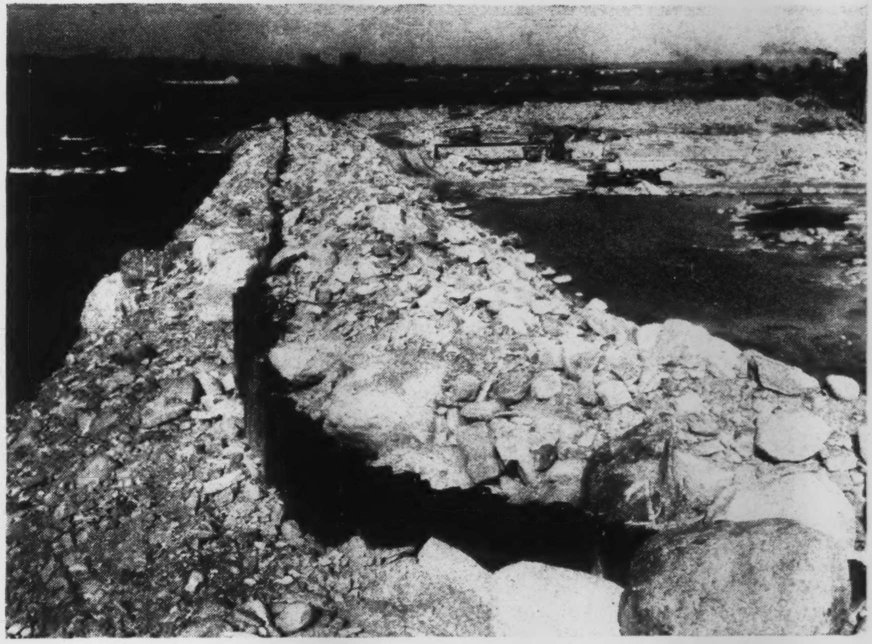
Next, the contractor started the

work dike, extending it downstream along the north side of the construction site. At the same time, he breached the old tail race dike just above its junction with the work road to let the water from the falls impounded by the work road, flow into the tailrace.

So steep is the gradient of the falls, that as soon as a short length of work dike had been completed the area inside of it became un-watered, permitting power shovels to work on the bed of the falls. Then the power shovels and dump trucks went to work in earnest, completing the work dike with material from the work road and with rock excavated from inside of the protected area.

Needless to say, considerable material was washed away by the rapid waters, but eventually the work dike was completed. During most of this time all 16 compensating gates located upstream beneath the International Railroad bridge were open, with a total discharge down the falls of 50,000 cfs.

At one point in constructing the work dike, however, the going got so tough that all but three of the compensating gates were closed for nine days, during which time some 700 ft. of dike was completed. In general, the work dike was built 8 ft. above the water level, and 30 ft. wide at the top.



ROCK-FILL COFFERDAM with steel sheetpiling core (foreground) and cellular cofferdam (background) will protect the site until completion of the power plant in 1951.

Three types of cofferdams

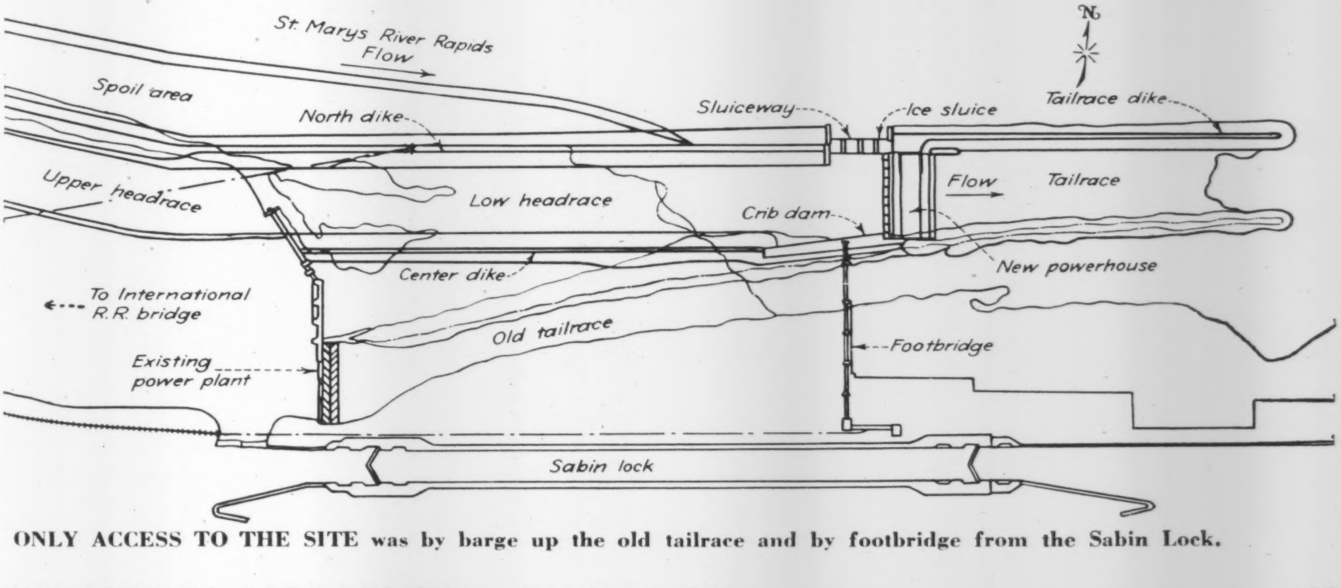
Three types of cofferdam were required inside the work dike to protect the site. Starting at a junction with the headrace dike of the present power canal, at the northwest corner of the site, some 1,000 ft. of rockfill cofferdam was constructed along the north side of the area. It has a top width of 18 ft., side slopes of 1 on 1, and is faced on the rapids side with a clay blanket 3 ft. thick at the top and 8 ft. at the bottom.

The next 500 ft. section of cofferdam is rockfill, 20 ft. top width, side slopes of 1 on 1, with a single line of steel sheetpiling core wall. The outer 5 ft. next to the turbulent rapids, is heavy rockfill, and the inner 15 ft. is common rock excavation. A clay seal ties the bottom of this cofferdam to existing bed rock in the rapids.

Cells connect sheetpile diaphragms

Connecting with the downstream end of the core-wall cofferdam is the section of rock-filled steel sheetpile cellular cofferdam, containing 63 cells, 20 ft. 8 in. and 18 ft. 8 in. in diameter. These cells, with connecting sheetpile diaphragms, completely enclose the three exposed sides of the downstream 500 ft. of the site, tying into the existing off-shore tailrace dike of the old power plant.

Constructing the cells followed



ONLY ACCESS TO THE SITE was by barge up the old tailrace and by footbridge from the Sabin Lock.

DOWN 21 FT. INTO SOLID ROCK, with 14 ft. more to go to the bottom of the powerhouse. Close excavating tolerances in some areas required channeling of rock by close drilling and broaching (background).

conventional pattern, using a special four-spud template for spacing the 22- to 28-ft. steel sheetpiling. Each spud was adjustable to compensate for the irregular surface of the ledge rock in the rapids.

In placing the cells, the overburden was removed and piling lowered on to bed rock. A few blows of a steam pile-driving hammer seated them on the rock and anchored them until they were ballasted. The sheetpiling along the old tailrace were driven by a crane mounted on one of the barges. The remainder were driven by a crane operating on the work road.

Two piles omitted for drainage

Construction was started in Aug. 1947 and by December, when most of the job was shut down for the winter, the rockfill and core-wall cofferdam had been completed. Also, all 63 cells had been driven but not completely filled. Two sheet-piles were left out of one pair of downstream diaphragms connecting adjacent cells to let the area drain during the winter.

TABLE OF MAJOR EXCAVATION AND COFFERDAM QUANTITIES

Item:	Quantity:	Unit Contract Price:
Cofferdam:		
Rock fill	29,500 c.y.	$0.10
Common fill	22,000 c.y.	0.10
Clay seal	18,700 c.y.	1.00
Placing clay seal	18,700 c.y.	0.90
Steel Sheetpiling (furnishing)	2,519,000 lb.	0.08
Placing Steel Sheetpiling	3,268,000 lb.	0.04
Installation of Pumps	....	18,700.00
Unwatering and Maintenance Pumping	800,000 M-gal.	0.08
Common Excavation	148,800 c.y.	1.30
Rock Excavation	47,000 c.y.	8.50
Channeling Rock	2,600 sq.yd.	20.00
Core Drilling	2,200 lin.ft.	5.00
Pressure Grouting	800 c.f.	3.50
Pressure Testing	38 hr.	15.00
Dumped Rock Fill	41,000 c.y.	0.10
Washing Rock Fill	41,000 c.y.	0.20
Unloading Steel Sheetpiling	458 tons	4.50

Last May, the enclosed area was de-watered and excavation resumed. Contract completion date for the cofferdam construction and excavation was June 30, 1949 but good working weather and an aggressive construction schedule resulted in the completion of this contract in September, 1948.

One operation was continued throughout last winter, chiefly to speed completion of the job. It was the grouting of the foundation rock under the powerhouse. Working on top of the ice, the contractor drilled 38 holes each 60 ft. deep. They were drilled in three rows—28 holes, 10 ft. apart under the turbines and five each under the intake slab and draft tube slab, spaced 54 ft. apart.

Drilling in skid-mounted sheds

All drilling was done in a weather-tight building mounted on skids, with the grout machine operating in a second skid-mounted building. The lower 30 ft. of holes were grouted, using a "packer" inserted about 30 ft. above bottom of hole. The upper 30 ft. was not grouted since this ma-

WAGON DRILLS operating on timber templates insured accuracy of drilled holes for channeling rock. Portable pumps boosted seepage water to large electric pumps for discharge over the cofferdam.

terial was removed later as excavation for the powerhouse.

Excavated to neat lines

Excavation for the powerhouse extended 35 ft. below the bed of the rapids. The material was a sandstone varying from medium soft at the surface to hard at the bottom of excavation. Much of the excavation was to neat lines with zero tolerance, requiring drilling and broaching in the upper strata and close drilling (2½-in. holes at 4½-in. c. to c.) in the lower strata of sandstone.

Where excavation to neat lines did not apply, a drill pattern was followed that kept the bottom of exacavation on a sufficiently flat slope to permit trucking from bottom of hole to the spoil area. To do this, holes near the outer edges of the excavation area were drilled only 2 ft. deep, with depth of holes increasing progressively toward the center of excavation.

Holes were drilled on 5-ft. centers, each way, and loaded with about 1-lb. of 40- or 60-percent dynamite per cubic yard of rock produced. They were wired in parallel series and fired with millisecond caps, in waves of four rows at a time. Maximum charge detonated at one firing was 1,200-lb. of dynamite in 320 holes.

All firing was done from a central tower atop the contractor's maintenance shop where the blasting foreman had an unobstructed view of the entire area. Electric power for blasting, and floodlighting the area at night, was taken from a nearby 220-volt electric transmission line.

Four large pumps needed

As shown in the accompanying table, the total pumpage of 800,000,000 gal. of water was an appreciable contract item. Four electric pumps were used. Three were 15-hp., single-stage, 1,500-g.p.m. against a 26-ft. head. The fourth was 30-hp., two-stage, 1,500-g.p.m. against a 56-ft. head. Measurement was by the jet-deflection method, wherein the discharge in gallons per minute was calculated as a function of the size of discharge pipe and the measured deflection of the stream of water.

The powerhouse will measure 120x216-ft. overall, with the long dimension running north and south. It will be 120-ft. high from roof to bottom of draft tube. In passing through the turbines, water will drop a maximum of 27 ft. from maximum headwater to minimum tailwater elevation.

Current plans call for the installation of three 5,333-kva. main generating units and one 2,500-kva. auxiliary generator for a total plant capacity of 18,500-kva. Provision also was made in the design to permit extension of the plant southward and install seven additional generators to bring the total power output up to 44,000 kva. This ambitious plan, however, is in the far distant future since it will be many years before additional electric power will be needed in that part of the country.

Two contracts were awarded in July for completion of the project (*ENR*, Aug. 12, p. 15). One for $3,564,700, was to the Tuller Construction Co., Red Bank, N. J. for construction of the power plant and installation of equipment. The other, for $916,000, was to Dunbar & Sullivan Dredging Co., Detroit, Mich., for excavating the raceways and constructing rockfill dikes.

Contractors and engineers

The contract for cofferdam construction and excavation, totaling approximately $1,000,000 was held by the United Construction Co., Winona, Minn. However, its subsidiary company, The Soo Constructors, Inc. did the work under a sub-contract. The sub-contractor's personnel included: J. A. Henderson, president; V. R. Wood, vice-president and project manager; W. G. Buehler, general superintendent; H. M. Wolpers, civil engineer; A. J. Ross, night superintendent; G. McIntyre, blasting foreman; and P. J. Flannery, office manager.

The project is being built by the Corps of Engineers, under the supervision of the Detroit District. Col. A. Riani is district engineer, and Tom C. Trelfa, chief of the engineering and operations division. Engineer-in-charge was J. E. Harns later succeeded by C. A. Aune. F. N. Ricks is project engineer assisted by Bancroft Bufe and Arlington Joseph.

Design plans for the power plant, complete with all appurtenances, were prepared by Erik Floor and Associates, Chicago, Ill.

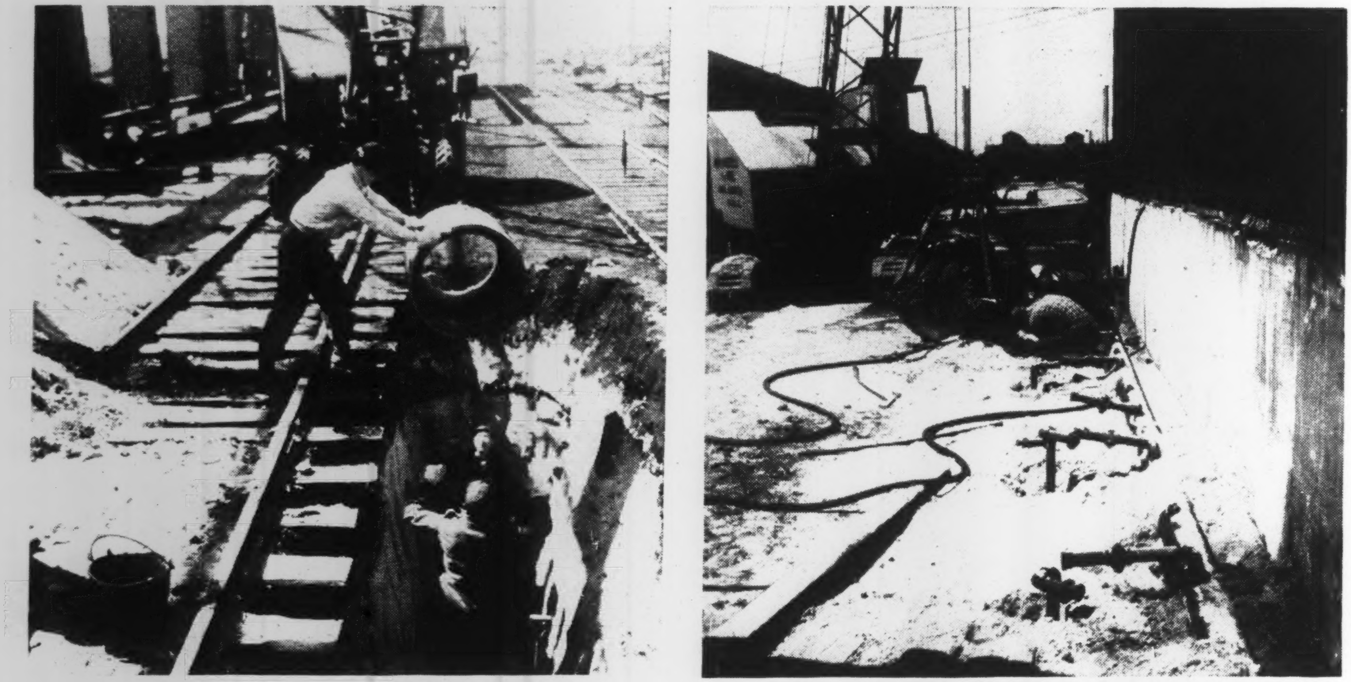


FIG. 1. CONSTRUCTION DIFFICULTIES include trenching and pipe-laying close to intraplant railroad tracks (at left) and adjacent to existing buildings (at right). High groundwater level requires close spacing of wellpoints.

New Sanitary Sewers for Gary Steel Mills

COMPLYING with a U. S. Supreme Court directive ordering four Indiana cities and 20 industries in the Calumet Industrial District, to reduce domestic and industrial pollution of Lake Michigan (*ENR* Oct. 28, 1943, vol. p. 645, and Feb. 10, 1944, vol. p. 169, U. S. Steel's subsidiary companies in Gary, Ind. are installing 20 miles of sanitary sewage collector lines discharging into the Gary Sanitary District sewage system. Companies participating in this $2,250,000 program are: Gary Steel Works and Gary Sheet & Tin Mill Divisions of Carnegie-Illinois Steel Corp., the National Tube Co. (Gary Works), the American Bridge Co., and the Elgin, Joliet and Eastern Railway Co. Following is a description of the five new sewer systems with design and construction details—EDITOR.

12-MI. SYSTEM FOR GARY STEEL WORKS

Installing a complete sanitary sewage-collecting system in an existing steel mill, might appear no more complicated than constructing a collector system in any highly industrialized municipality. But just the opposite is true at Gary Steel Works, where nearly 40 years of expanding and adding to the original plant (erected in 1909), has left little room for a sewer trench.

Another factor is the necessity of installing the $1,500,000 sewer system (Fig. 3) with a minimum of interruption to the daily operation of the steel mill.

Flat swamp land reclaimed chiefly with dune sand and slag, together with a groundwater table only 12 ft. below the surface, precluded the possibility of a complete gravity-line installation. Nine pumping stations are required some of which merely boost the sewage over existing underpasses and other underground installations that can neither be bypassed nor underpassed.

About 250 intraplant railroad tracks must be underpassed by the new sewers. This is done by open trenching where tracks can be cut out temporarily; and by jacking or bridging the trench with steel-beam falsework where tracks must be kept in service.

In some locations long stretches of sidewalk are torn up for sewer installation. In others, the lines parallel existing track facilities so closely that only 8 to 12 ft. of open trench is permitted at one time—with pipe being installed rapidly and backfilled between passages of locomotives hauling ingots, blooms, ladles and other heavy loads.

Two contracts cover the entire project. One includes furnishing and installing gravity sections of sewer lines; the other construction of the pumphouses and pumping equipment, force mains and sewer connections to wash houses and toilets.

Both contracts were let on lump-sum bases, plus unit-price adjustments for additions and deductions and including escalator clauses for increasing material prices and wage rates. Completion of the entire project is required by May 21, 1949.

Focal point of the system is the main pumphouse located just outside the Broadway Street entrance to the plant and north of the Grand Calumet river. A network of 6-in. to 42-in. sewers inside the plant will deliver sewage to this point to be pumped through 900 ft. of 24-in. pressure main to a junction with a 72-in. gravity-flow city main. This involves about a 12-ft. lift.

Two main interceptors will extend from the pumphouse into the plant. A 42-in. line will serve the merchant and strip-mill area, the primary-mill area and the openhearths. A 36-in. line will collect all sanitary sewage from blast furnaces, the huge coke plant and the National Tube Co. plant, both of which are located east of the main plant.

The entire collector system (Table I) includes 22,800 ft. of reinforced concrete pipe, 38,000 ft. of vitrified clay pipe, 2,800 ft. of pressure steel pipe, ten junction boxes, 270 manholes and nine pumping stations.

Designed for twice present capacity

Basic sewer-design data was arrived at by actual measurement of peak loads in wash houses and other sanitary facilities during working-shift changes. Sewers were then sized at twice the indicated capacity. Pumping stations were designed for present actual conditions, it being recognized that pumping facilities could be added as need developed. Present total flow, divided by the present maximum of 22,000 employees, indicates a daily rate of 75 gal. per capita.

TABLE I—COLLECTOR AND PUMPING SYSTEM FOR THE GARY STEEL WORKS

Size (in.)	Length (ft.)
Precast Concrete Pipe:	
42	900
36	2,800
27	1,400
24	7,400
21	1,000
18	6,300
15	3,000
TOTAL.......	22,800
Vitrified Clay Tile:	
12	4,600
10	7,000
8	14,000
6	13,000
TOTAL.......	38,600
Pressure Steel Pipe:	
24	900
14	1,300
6	600
TOTAL.......	2,800
GRAND TOTAL.......	64,200

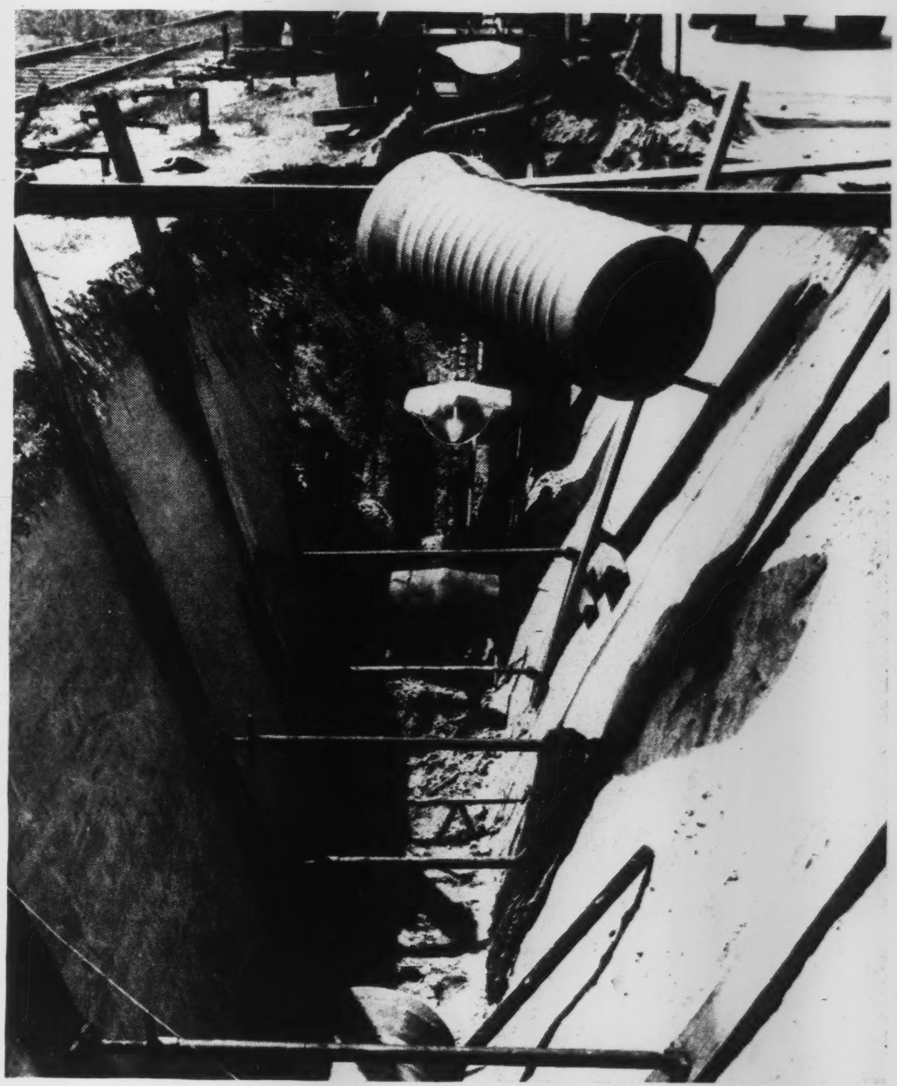


FIG. 2. OPEN TRENCH sandwiched between main driveway and railroad track at the Gary Sheet & Tin Mill required close spacing of trench jacks, while high groundwater necessitated intensive wellpointing.

Pumphouses vary in size from 6x6-ft., containing a single 50-gpm. ejector, to the main 21x42-ft. single-story pumphouse, housing three 5,000-gpm. pumps, one of which is a standby.

The main pumphouse contains a relatively small wet-well designed for 2-min. detention—depending chiefly on the 36- and 42-in. mains for temporary storage during peak loads of sanitary sewage. As a precaution against power failure, a 66-in. overflow has been installed to discharge directly into the Grand Calumet river. It will be equipped with a flap-gate to protect the plant from any sudden rise in the river.

All pressure lines are seamless steel pipe with welded joints, coated outside with a bituminous compound and wrapped with felt. Joints in the tongue-and-groove reinforced concrete pipe located above groundwater table are cement-sand mortared, while those below the water table are sealed with a bituminous mastic.

The 24-in. force main from the principal pumphouse to the city sewer is welded in sets of three 22-ft. lengths for open-trench installation. Crossing the Grand Calumet river, this line is suspended from sidewalk brackets on the Broadway Street bridge.

No additions to the plant's existing washroom and toilet facilities are being installed in conjunction with the Gary Steel Works sanitary-sewage collector system. New laterals tap into existing drainage outside various buildings. The present program calls for no alteration of the plant's industrial-waste disposal system. Process

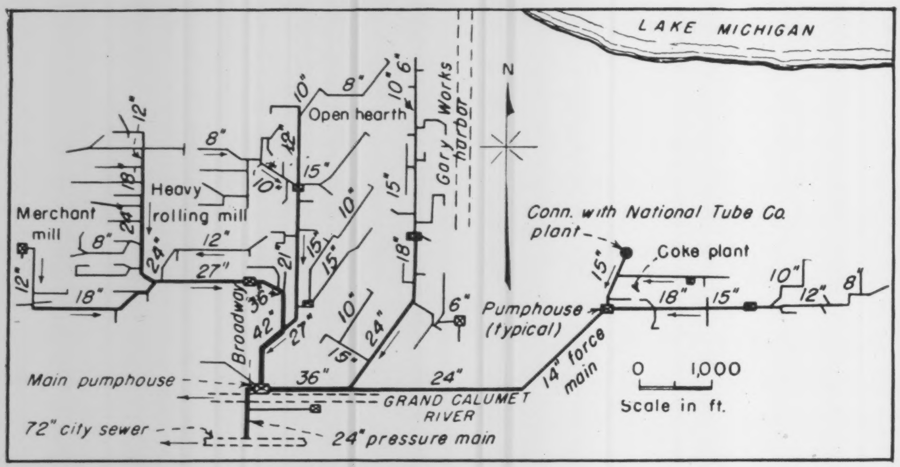

LAKE MICHIGAN
N
Merchant mill
Heavy rolling mill
Open hearth
Gary Works harbor
Broadway
Conn. with National Tube Co. plant
Coke plant
Pumphouse (typical)
14" force main
Main pumphouse
GRAND CALUMET RIVER
72" city sewer
24" pressure main
0 1,000
Scale in ft.
12"
18"
24"
8"
27"
12"
10"
15"
21"
36"
42"
6"

FIG. 3. NINE PUMPING STATIONS are required in the 12-mi. sanitary sewer system for Gary Steel Works.

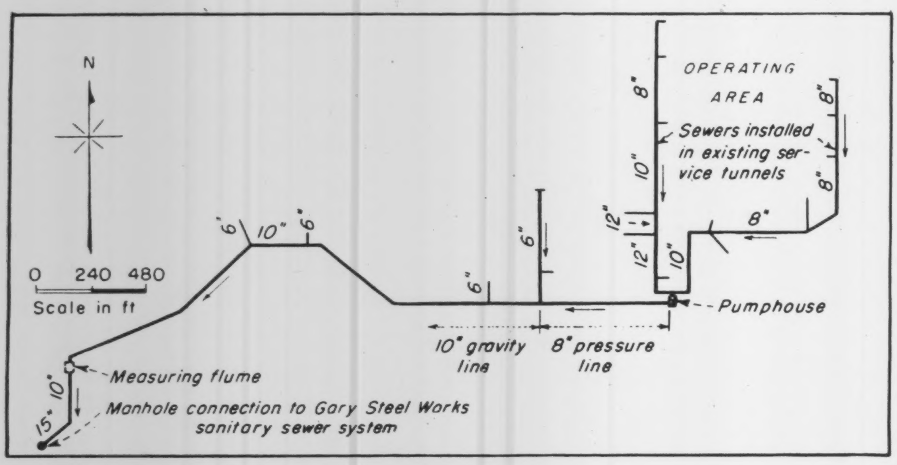

N
0 240 480
Scale in ft
OPERATING AREA
Sewers installed in existing service tunnels
Pumphouse
10" gravity line
8" pressure line
Measuring flume
Manhole connection to Gary Steel Works sanitary sewer system
6"
10"
8"
12"
15"

FIG. 4. ALL SANITARY SEWAGE from the National Tube Co. is discharged into a 15-in. line of the Gary Steel Works collector system.

water and industrial waste-water from the plant will continue to be discharged into the Grand Calumet river.

Engineers and contractors

Plans and specifications were prepared by the engineering department of Gary Steel Works, under the supervision of F. G. Heydorn, assistant construction engineer, reporting to J. D. Rollins, chief engineer. Howard Kelso is field engineer on construction and H. C. Hunter, construction engineer.

T. P. Dowdle Co., Chicago, are contractors for installation of the sewer lines. M. W. Crum is construction superintendent. F. H. McGraw & Co., Chicago, are contractors for installation of the pumphouses, force mains and surface connections. H. E. Smith is general superintendent.

NO PEAK FLOW FROM NATIONAL TUBE CO.

All sanitary sewage from the National Tube Co. (Gary Plant) will discharge into an interceptor of the Gary Steel Works' new sewer system (Fig. 4), and flow by gravity to the main pumphouse at Broadway Street and the Grand Calumet River. From this point, sewage from both plants will be pumped through the previously described 24-in. pressure line into a 72-in. city sewer for treatment in the Gary Sanitary District's plant.

Decision to adopt this joint method of disposal necessitated designing the National Tube Company's sanitary system in such a way that its peak discharges will not coincide with those from the Gary Steel Works. Such an arrangement requires less pump capacity and smaller pipe sizes in the lines affected.

To meet these requirements for controlled discharge, the single pumphouse in the National Tube Company's sanitary system includes a 48,000-gal. receiving well. This is sufficient capacity to store all sanitary sewage from wash houses and toilets for a one-hour period during the change of the maximum work shift, plus one hour of flow immediately preceding and following shift change.

This avoids simultaneous peak discharges from both plants, and allows five hours during which the receiving basin can be emptied at a nominal rate prior to the next shift change.

Based on a maximum employment of 3,000 mill and 600 office employees, discharge during a one-hour maximum shift change was calculated to be 43,400 gal. This, together with a 2,600-gal. flow during the preceding hour and a 2,000-gal. flow the following hour totals 48,000 gal. of required storage in the sump.

Operation of pumps

Three vertical, centrifugal 200-gpm. automatic electric pumps in the pumphouse will empty the sump in five hours with adequate standby capacity.

One pump will be started by timeclock control one hour after the shift change. It will pump the entire contents of the sump, plus inflow, during the five-hour pumping period. The second pump will go into service by electrode control only if flows during the pumping period exceed capacity of the first pump.

The third pump serves chiefly as a standby. It also will go into service by electrode control, and only if an emergency arises and the other two pumps cannot handle the flows. All pumps, once started will continue to operate until the sump is emptied.

Other important features in the 22x14-ft. single-story pumphouse include an electric-driven comminutor at the sump inlet together with bar screen for emergency use, and a float-operated regulating valve to prevent flooding the pumproom in the event of a power failure.

The new sanitary-sewer system of the National Tube Co. plant, estimated to cost $150,000, was completed this past summer. Operation of the system, however, cannot be started until the Gary Steel Works starts pumping into the Gary sewage system late this year or early in 1949.

Sanitary sewage within the plant will be collected by a system of lateral connections to existing washroom and toilet facilities, and carried to the pumphouse by two collector mains (Fig. 4) installed in existing service tunnels. Sewers within the plant, including collectors, total 1.550 ft. of 8-in., 920 ft. of 10-in.. and 340 ft. of 12-in. pipe—all seamless tubing, bituminous coated inside and out, with joints closed by mechanical couplings.

Discharge to be recorded

From the pumphouse sanitary sewage will be pumped about 580 ft. with a 25-ft. lift to the high point in the 8-in. outfall line; from here it will flow by gravity through 2.800 ft. of 10-in. line to a manhole connection with the Gary Steel Works' sanitary-sewer system. A Parshall flume is installed in the line just ahead of this junction. It is equipped with an indicating totalizing-recording gage to measure rates of flow and record total pumpage from the National Tube Co. plant.

Upon completion of the new sanitary-sewage system, existing septic tanks throughout the plant will be abandoned. Installed when the plant was built many years ago, the tanks have been servicing wash-rooms and toilet units. Effluent was collected in combined drains for discharge into the Grand Calumet river, without further treatment.

In preliminary studies, consideration was given to constructing a sewage-treatment plant for the National Tube Co. area. It was abandoned, however, in favor of the plan adopted which is deemed more economical both in initial cost of construction and in operation.

Engineers and contractors

Preliminary studies, design plans and specifications were prepared by Rollin F. MacDowell, consulting sanitary engineer, Cleveland, Ohio. L. V. Johnson, now assistant chief engineer, National Tube Co., Pittsburgh, served as project engineer on construction. H. K. Hybarger is chief engineer of the Gary plant, and G. N. Giberson, chief civil engineer.

Contractor on the entire project is Fred Slathar, Hammond, Ind. W. Slathar is in charge and J. A. Piersol is superintendent of construction.

GARY SHEET AND TIN MILL SEWER SYSTEM

General plan of the Gary Sheet and Tin Mill's new $525,000 sewer system is to collect all sanitary sewage by a network of 6-in. and 8-in. laterals, feeding through 12-in. and 24-in. interceptors (Fig. 2) to a single pumphouse. From there it will be pumped through 4.500-ft. of 12-in. steel pressure line to a 72-in. city sewer leading to the Gary Sanitary District treatment plant. Completion is scheduled for Nov. 1 of this year.

Some 28.000 ft. of 6-in. to 24-in. sewer is being installed in the plant to the pumphouse. This supplements an existing collection system for part of the 460-acre plant which formerly discharged into two large combined outfalls leading to the Grand Calumet river. Under the new plan existing collectors will become part of the new sanitary system.

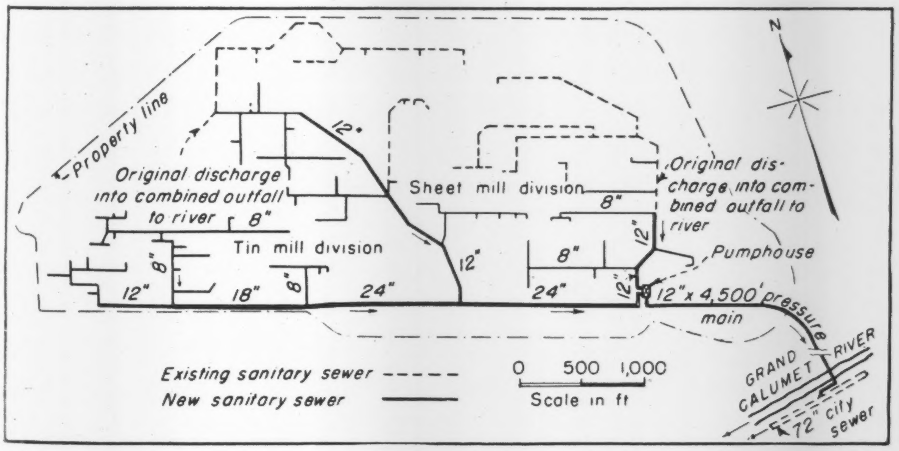


FIG. 5. SANITARY SEWAGE from the Gary Sheet & Tin Mill will be pumped to a connection with the city sewer system through 4,500 ft. of 12-in. steel pipe pressure main.

Installing sewer lines in this collection system posed a multitude of problems. Probably the most difficult one was that of trenching and laying laterals in buildings producing finished tin-plate. In these areas careful control of dust and sand was necessary at all times, requiring liberal use of water sprays while breaking through old concrete floors and during trench excavation. Lack of storage area often required double handling of the excavated material from the trenches.

Much wellpointing needed

Considerable wellpointing was needed throughout the plant due to a high groundwater table. In the tin mill it was only 4½ ft. below the concrete floor. One long section of 18-in. and 24-in. sewer, not only paralleled closely one of the main driveways but also was located directly under a 22.000-v. overhead electric-transmission line. This sewer also crossed under five heavily travelled streets.

In addition, it was necessary to locate most of the 12-in. pressure line under a concrete sidewalk, requiring removal and replacement of 4.000 ft. of walk.

The sanitary-sewage system is designed to serve all washhouse and toilet facilities for 7.500 employees. Maximum design pumpage is 2.000 gpm., furnished by three 800-gpm. automatic electric units in the pumphouse.

Sewers smaller than 12-in. dia. are vitrified clay. Those 12-in. and larger are precast reinforced concrete. Joints are made with a plastic compound. The 12-in. pressure line is unlined but coated with an asphalt compound.

Engineers and contractors

The T. P. Dowdle Co., Chicago, holds a lump-sum contract for the entire sanitary-sewer system. Suhr, Berryman, Peterson and Suhr, Chicago, are consultants on design, engineering and supervision of construction.

For the Gary Sheet and Tin Mill. Fred K. Schefe is works chief engineer: C. A. Bollinger, assistant works chief engineer: H. S. Gordon, construction engineer: and L. R. Atkins, field engineer.

SIMPLE PROBLEM FOR AMERICAN BRIDGE CO.

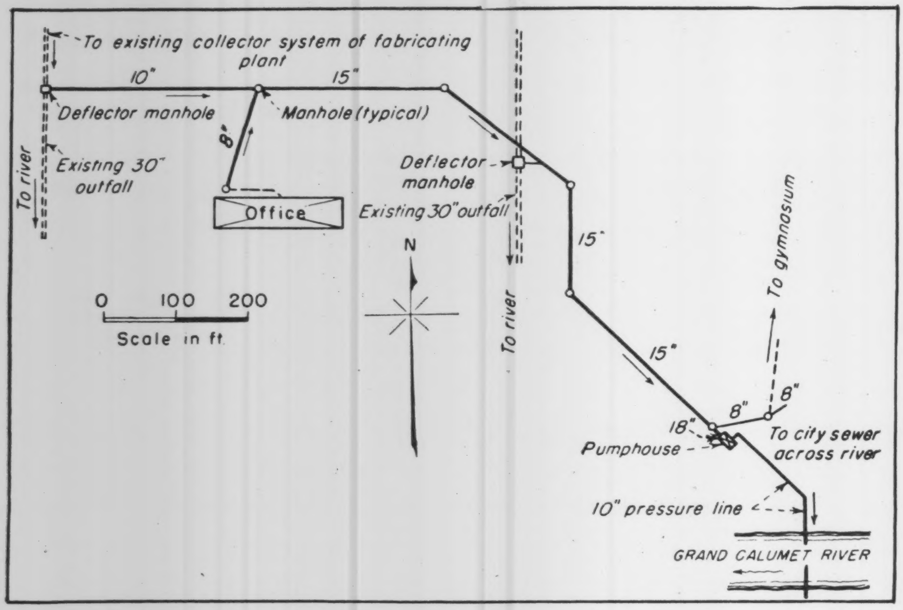


FIG. 6. FIRST TO COMPLETE its sanitary sewer system was the American Bridge Co. (Gary plant) which started pumping into the Gary sewer system on Aug. 19, 1945.

Providing an independent sanitary system for the Gary Plant of the American Bridge Co. was much simpler than for the other three U. S. Steel subsidiaries. Maximum sewage flow for the entire plant is 1,000 gpm. for an estimated peak employment of 2,500 workmen in the fabrication plant, 200 office employees, a company gymnasium and a small-police-protection house.

Two contracts were awarded for the improvement, which cost a total of $42,000. One included sewer lines and the other a pumphouse. In addition, 710 ft. of pressure main and pumping equipment were installed by American Bridge Co. forces. Construction was started late in 1944 and completed the following August.

The original combined sanitary and storm-water gravity system included two 30-in. vitrified clay mains (Fig. 6) connecting with a collector system in the fabricating plant, and running due south to discharge into the Grand Calumet river.

An 8-in. line connected the office building to one of the main sewers, while the gymnasium and police house had an independent 8-in. line discharging directly into the river.

Under the plan adopted by the company and approved by the Indiana State Health Dept., no new sewer was required in the fabricating plant. Instead, provision was made to carry sanitary sewage in existing 30-in. mains by building an east-west interceptor just south of the plant.

Permanent 4½-in. high concrete deflectors, built into new manholes at junctions of old sewer mains and the new interceptor, divert sanitary sewage to a pumphouse from which it is pumped to an existing 84-in. city sewer. Under this arrangement all sanitary sewage and storm water, except during very heavy rains, passes through the pumphouse. During such storms the original 30-in. lines discharge directly into the river.

Vitrified clay pipe was used for the entire interceptor line. It includes 180 ft. of 8-in., 290 ft. of 10-in., and 870 ft. of 15-in. line. The 710 ft. of 10-in. steel pressure pipe from pumphouse to a junction with the city sewer crosses over Grand Calumet river, suspended from sidewalk brackets of the Bridge Street bridge. Joints were closed with mechanical couplings and the pipe was painted inside and out with an asphaltic compound. Eight manholes were included in the entire system.

The 21x10-ft. concrete block and reinforced concrete pumphouse contains a 9x10x13-ft. sump. It is equipped with two 750-gpm. automatic electric pumps, operating alternately against a 20-ft. head.

Contractors and engineers

Albanio Davio, Gary, was the contractor for sewers and the late Marcello Gerometta, Gary, held a contract for constructing the pump house. Plans and specifications were prepared by the American Bridge Co., under the supervision of W. H. Walter, chief mechanical engineer. Construction was in charge of W. A. Thiel, superintendent of maintenance. R. B. Hunter is plant manager.

SINGLE SEWER FOR E. J. & E. RY.

Sanitary sewage from the Elgin, Joliet and Eastern Railway Company's Kirk Yard, located a short distance south of the Gary Sheet & Tin Mill plant, was formerly delivered directly to the Grand Calumet river by a 36-in. brick sewer. It now is diverted by a new manhole in the brick sewer through a short length of 18-in. clay pipe to a new pumphouse. From this point sewage is pumped through 1,560 ft. of 8-in. steel pressure pipe across the Grand Calumet river to a 72-in. city sewer.

The pumphouse is reinforced concrete and equipped with two electric-driven 200-gpm. vertical centrifugal pumps. These units lift sewage against a 40-ft. head from a 12x11x12-ft. deep wet-well in the pumphouse.

About 1,200 ft. of 8-in. pressure line shares a common trench along Buchanan St. with the 12-in. pressure line of the Gary Sheet & Tin Mill. Both lines cross the river on sidewalk brackets hung from the Buchanan Street bridge.

Under normal conditions this system will handle sanitary sewage and storm water. During heavy storms.

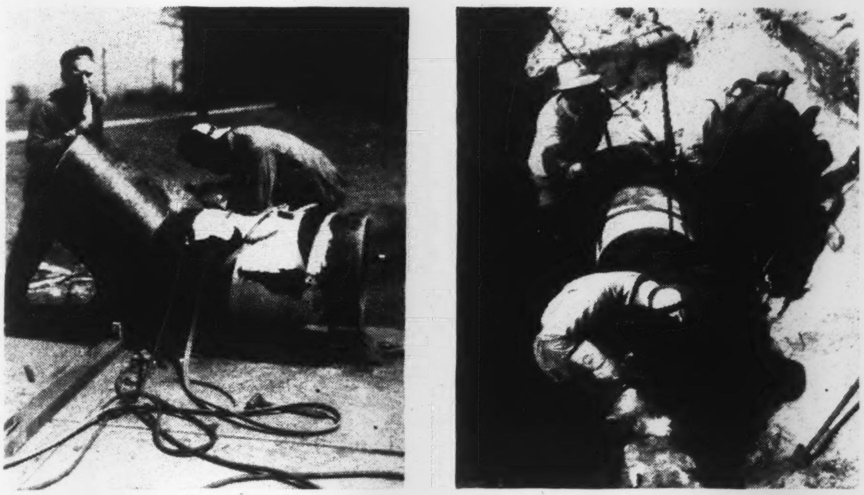


FIG. 7. INITIAL WELDING of 40-deg. offsets of pressure lines, needed to clear underground obstructions, were made at the site (at left) and completed in the open trench (at right).

however, a baffle in the new manhole will divert the excess into the existing 36-in. brick sewer leading directly to the river.

Construction of the E. J. & E. Ry. Co. sanitary system was started in March of last year and at present is about 75 percent complete. The Powers-Thompson Construction Co., Joliet, Ill., holds the $41,000 contract.

All design and engineering was under the supervision of C. M. Noethling, assistant office engineer, assisted by A. M. Spires, designer, both reporting to F. H. Masters, chief engineer. F. G. Campbell, having succeeded Mr. Masters as chief engineer, is now in charge of the work.

Adequate capacity will be provided by the Gary Sanitary District's activated-sludge disposal plant to handle all sanitary sewage from the five U. S. Steel subsidiaries according to W. W. Mathews, superintendent. The plant, now serving 100,000 population, has a rated capacity of 40 mgd., based on a population of 170,000. It can operate at a maximum rate of 58 mgd. with primary treatment only.

When the sanitary-sewage systems are completed, the Gary Steel Works, together with the National Tube Co. plant, will discharge into the Gary sewer system at a rate of 1.5 mgd., with one-hour peak loads at a rate of 7 to 9 mgd. Since the junction point of the two systems is about 3 mi. from the treatment plant, peak loads will be reduced considerably by the time they reach the plant, permitting adjustments in plant operation to handle the additional load.

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Protection of Concrete from Attack By Alkali Soil or Sea Water

The latest in a long series of studies concerned with the durability of concrete when exposed to alkali soils and sea water brings to light certain new facts which should influence such construction in the future.

The direct relationship between impermeability and durability has always been recognized by those skilled in marine construction. The principal new developments in the field were reported by Thomas E. Stanton, materials and research engineer, California Division of Highways, at the 1948 meeting of the American Concrete Institute as a result of his study of Pacific Coast installations. They are: (1) the discovery that one cause for the cracking of concrete is an adverse reaction between the alkali constituent of the cement and certain minerals in the aggregate, and (2) positive proof of the increased resistance to sulfate attack achieved through air entrainment.

It has been found in one case, the Ford Motor Plant at Long Beach, Calif., that failure was caused primarily by the action of sea water on an unsound aggregate. A frequent cause of concrete deterioration in certain areas, however, is the expansive reaction between certain minerals in the aggregate and cements of high alkali content. As a result of this expansive reaction extensive cracks were opened in the pavement and sea walls along the coast in Ventura County. Here cracks appeared even where the concrete was protected from sea water but little disintegration occurred save in places where sea water remained long enough to penetrate and saturate the concrete. There is ample evidence that if non-reactive aggregates or a low-alkali cement had been used, no cracking and subsequent disintegration would have occurred.

Comprehensive experiments recently conducted prove the high resistance to sulfate attack of air-entraining portland-cement concretes. Although the degree of the resistance varied with the richness of the mix and with the C_3A content of the cement, the results were uniformly better when the principle of air entrainment was introduced.

From laboratory tests and the examination of existing structures—including the 54-year old piers supporting San Francisco's Ferry Building—Mr. Stanton draws several conclusions relative to the production of durable, sulfate-resisting concrete. The principal requisites are sound cement and aggregates which will be non-reactive in combination; a well-designed mix capable of producing an impervious concrete; and careful construction procedures to prevent segregation and honeycombing.

In his paper Mr. Stanton brings out the fact that these precepts will produce durable concrete with any of the five standard types of cement. However, to compensate partially for poor workmanship and poorly-designed pervious mixes, a Type II and/or an air-entraining portland-cement afford an added protection against sulphate attack.

New Finishing Device Tested on Virginia Highways

A finishing device for concrete pavements that is believed to have numerous advantages over the old single strike-off surfacer is being tried by the Virginia Highway Department. It was designed by R. R. Dawson, one of the department's engineers, to overcome the defects of the old finishers.

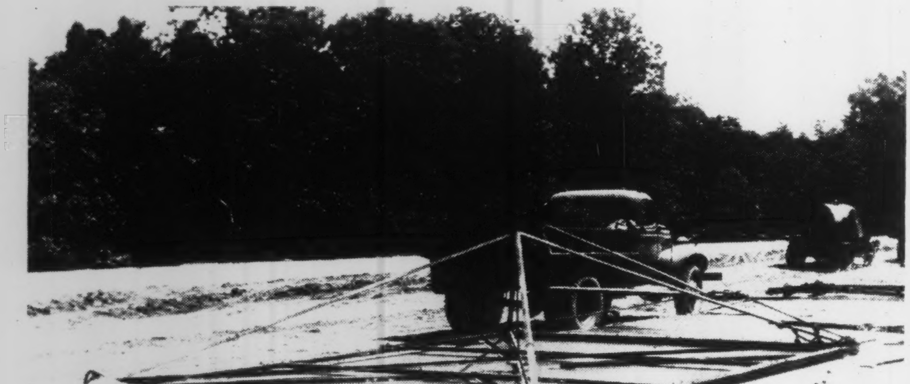
The new smoothing device consists of a frame 13x20 ft. carrying a transverse strike-off with a belt on the underside across the leading end of the device as it rides on the forms or the edge of an adjoining strip of pavement. Behind this are two converging strike-off boards of similar construction that push excess mortar to the center of the slab. These are set at an angle of 45 deg. to the edge. Still farther back are two diverging strike-off boards which pick up the excess material along the center and push it back across the pavement to the edge to be wasted or picked up for use at points where there may be a deficiency of mortar.

The device has sufficient weight to press projecting stones down into the concrete or to force them out on the surface, filling the hole with mortar as it passes. The old type frequently rode over such stones leaving an accumulation of mortar around them. The cross movement of mortar insures the filling of any depressions.

At the rear of the frame is another transverse strike-off, which drags burlap sacking along the surface to give it the proper texture after all excess mortar, laitance or water has been pushed off.

Ultimately, it is planned to motorize the frame, mounting it on wheels, that will ride on the forms. Spring mounting is to be provided for the strike-offs so that they can be raised to clear the surface. When lowered, there will be no direct pressure on the belts.

The device now under test is fo use on pavements up to 12 ft. wide. Its width and length would have t be increased for greater widths o pavement.



PAVEMENT SMOOTHING DEVICE developed in Virginia (top) as seen from the rear; and below, a close-up of the leading transverse blade and converging strike-off blades.

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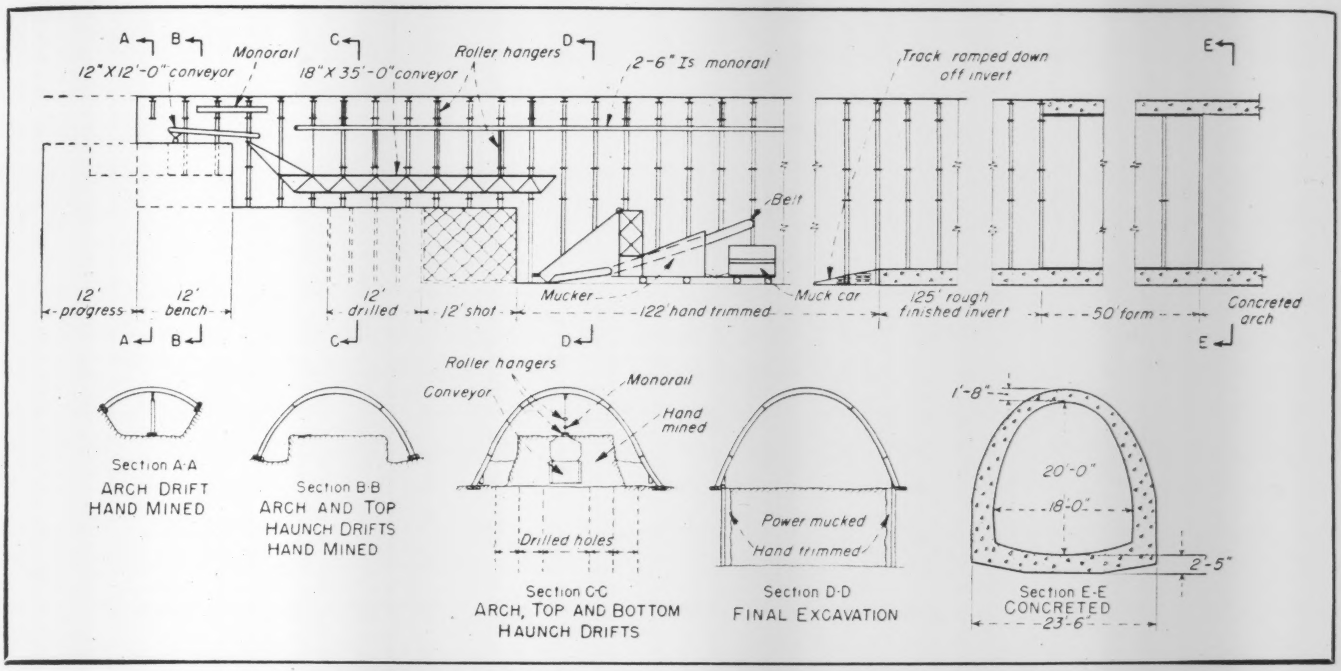
Influence of Rhododendron On Watersheds

Extensive *Rhododendron maximun* areas on important southern mountain headwater streams cause deterioration in site, and occupy space tha could be growing useful trees according to M. D. Hoover in the "Researc News" of the southwestern Fores Experiment Station, Asheville, N. C A test at Coweeta by Asheville pathologists showed that on identical soil the pH of the A-horizon was 4.6 unde rhododendron with hardwood overstory, and 5.8 where the rhododendron was absent. Nitrogen content o rhododendron litter was 0.3 percent and hardwood litter 0.8 percent.

Working on a 68-acre watershed, the Coweeta staff found that 25 acre had a rhododendron under-story with crown density of 70 percent and average height of 12 feet. The area o rhododendron leaf surface was foun to be 5.3 acres per acre of the rhododendron type. Therefore, the estimat is that there are 134 acres of rhododendron leaf surface on 25 acres o ground. It is proposed to clear cut all the rhododendron within this watershed to learn whether the species uses much or little water. The study is a step toward finding out what kinds o vegetation use least water while preserving forest soil and requiring little maintenance.


A
B
12"X12'-0" conveyor
Monorail
C
18"X35'-0" conveyor
Roller hangers
D
2-6" Is monorail
Track ramped down off invert
E
Belt
12' progress
12' bench
12' drilled
12' shot
Mucker
122' hand trimmed
Muck car
125' rough finished invert
50' form
Concreted arch
Section A-A
ARCH DRIFT HAND MINED
Section B-B
ARCH AND TOP HAUNCH DRIFTS HAND MINED
Roller hangers
Conveyor
Monorail
Hand mined
Drilled holes
Section C-C
ARCH, TOP AND BOTTOM HAUNCH DRIFTS
Power mucked
Hand trimmed
Section D-D
FINAL EXCAVATION
1'-8"
20'-0"
18'-0"
2'-5"
Section E-E
CONCRETED
23'-6"

EXCAVATING AND RIB-SETTING procedure on the Chicago South Side intercepting sewer.

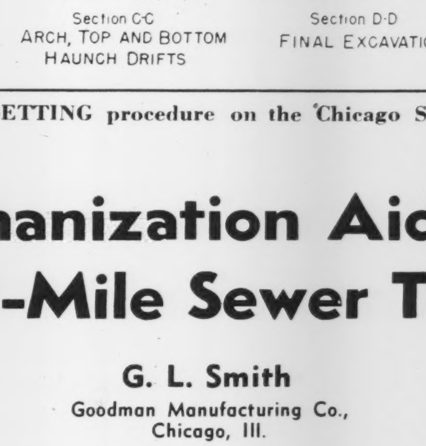
Full Mechanization Aids Driving Of 13-Mile Sewer Tunnel

G. L. Smith
Goodman Manufacturing Co.,
Chicago, Ill.

By fitting modern machine methods of mining, mucking, hauling and concreting into an efficient sequence of operations, the two contractors on Chicago's South Side Intercepting Sewer are keeping ahead of a schedule that calls for completion of 13 miles of tunnel between January, 1946 and January, 1951.

Driven mainly through hardpan at an invert depth of about 40 ft., and under 12-lb. air pressure, the bore, about 23½x24 ft. for the maximum finished section of 18x20 ft., is advanced on two benches and a bottom drift. Bench excavation is carried back to the mucking machine by suspended chain conveyors, where it is loaded into rail cars for storage battery haulage to the hoist shafts. Supported by steel arch ribs and steel liner plates until reinforcing and forms can be set, the bore is lined with concrete pumped from the surface through pipes drilled down at about 500 ft. intervals. From beginning to end, no operation that can be carried out mechanically is done manually.

Alignment of the sewer and its division into four contracts are shown on the accompanying map, as are the location of the construction shafts. At the two shafts on Contract One the contractor has installed his machine shop, storage yards, compressor house, change house, warehouses, lunch room, medical dispensary, engineers' and supervisors' offices and clerical and pay offices. The sanitary District of Chicago also maintains a resident engineer's office at the same location.


35th St
LAKE MICHIGAN
Extension to Racine Ave pumping station
Const shafts
CONTRACT NO 1
CONTRACT NO 2
CONTRACT NO 3
State St
CONTRACT NO 4
73 St pumping station
75th St
Const shafts
0
¼
½
1
2
Scale in miles

SEWER PROJECT serves a 27 sq. mile area with a population of about 1,000,000. It is divided into 4 contract sections for construction.

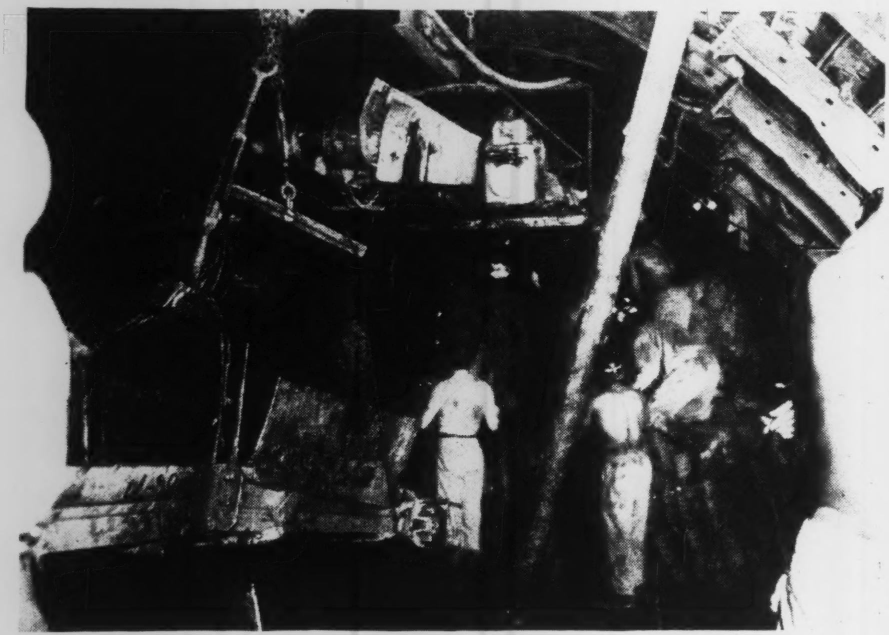
All of the air pressure for Contracts One and Two is being supplied from this one location, and it is tentatively proposed to use this same set-up for the north-south leg of Contract Four. Compressors will be installed at the other shaft locations to serve the remainder of Contract Four and all of Contract Three.

Work is being carried on simultaneously in four headings. Mining is carried on in two headings on each shift, and concreting, clean-up or track work is carried on in the other

Goodman Manufacturing Company photos

MINING THE TOP DRIFT. Hard clay, removed with pneumatic spades, is loaded directly into the suspended upper chain conveyor, partly shown.

CONWAY MUCKER AT WORK. A second mucker is held as a standby at each face, to avoid time lost due to breakdowns distant from shaft.



SPADING AND MUCKING the upper bench. Both conveyors are shown.

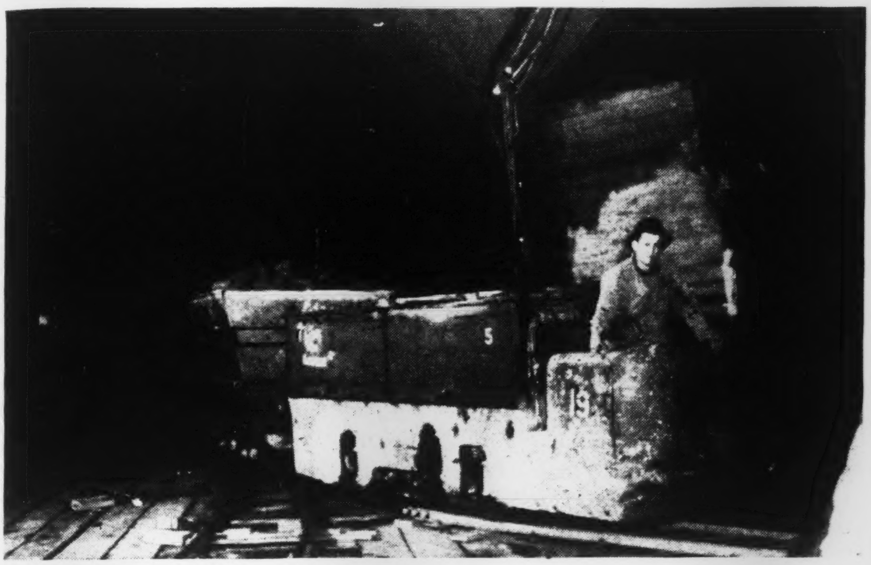
two headings on each shift. On the afternoon and midnight shifts there is, in addition, a bull gang that works wherever needed. The mining advance in each heading is 12 ft. per shift, so that in two headings the total daily advance is 72 ft. for three shifts. The basic plan of attack on the job as a whole is to advance the mining face about 122 ft. ahead of the concreted invert, and to keep the invert pours about 125 ft. in advance of the arch concrete.

The method of advancing the tunnel bore is shown in the first illustration. The bottom bench is drilled and blasted at the end of each shift, using only enough dynamite to move out the bottom slightly, and merely to shake the top. The arch drift is hand-mined with pneumatic spades, and the clay shoveled onto a chain conveyor in two flights, which dumps in front of a Conway mucking machine for loading into industrial railcars. Portable track sections 7½ ft. long are laid to advance the mucking machine, and are followed up by permanent track. Steel arch ribs are installed on 4 ft. centers to carry the roof, and after the bottom bench is removed steel legs are added as shown, without disturbing the earth that supports the ends of the arches.

Standby mucker in each heading

In order to avoid any possible delay at the face, each heading is supplied with two muckers, one as a stand-by. Thus, if a machine has a breakdown during the working shift, it is immediately pulled from the face and the stand-by machine taken forward. This permits the repair crews time to do a good job of correcting whatever trouble caused the original delay. This practice of using standby mucking machines is easily understandable in view of the considerable distance away from the shafts that the machines have to work. It is also related directly to the fact that about 100 4-yd. cars are loaded in each 6½-hour shift.

Loading and hauling methods have also been worked out so as not to cause any interruption. A total of 15 storage battery locomotives are used on the job, so distributed that two locomotives are used inside the air look and one outside at each heading. These locomotives each haul a 12-car train, with a loaded weight of 72 tons. So that this equipment can be used efficiently, the track layout has received special attention. Thus, a section of double track is laid extending



BATTERY LOCOMOTIVE hauls loaded muck train into temporary tunnel connecting twin bores near Shaft 1.

to an equilateral switch at the end of the invert, with one track for loaded trains and the other for empties. Then, since the concrete invert is carried rather close to the working face, an inclined single track is laid between the end of the invert and the mucking machine. A second equilateral switch connects the double track with the single track to the shaft. All track is 2-ft. gage.

In practice, for example, an empty train of twelve cars is brought to the face and placed on one side of the double track. A hoist located between the tracks and as close as practicable to the front end of the invert, is used to pull loaded cars up the incline from the mucking machine and onto the load side of the double track. This done, the hoist cable is removed from the loaded car and hooked to the back end of an empty, which is pushed to the edge of the incline and rolled to the mucking machine. This process is repeated until the 12 empties are loaded.

When the loaded trains reach the shaft, the cars are hoisted in pairs and emptied into a hopper which discharges into regular gondola type railroad cars. The excavated material is being used to fill in an abandoned quarry on Chicago's West Side.

Concreting

All concrete for tunnel lining is pumped from the surface. In advance of the tunnel headings, at about 500 ft. intervals, 12-in. holes are drilled from the surface to the top of the tunnel section by a gasoline-driven auger operating on a truck. Into these holes, eight-inch pipes are inserted and grouted, their bottoms and tops being capped to prevent loss of air pressure when the pipe is uncovered as the tunnel excavation reaches it. A given pipe is not used as a concrete inlet, except in emergencies, until the tunnel lining has been completed one section beyond it. Then it is hooked up to the concrete pump and used until 550 ft. of arch and 675 ft. of invert concrete have been poured when the pump is moved to the next inlet pipe. Although the equipment used is capable of pumping concrete through as much as 1,000 ft. of 8-in. pipe, a shorter pumping range was adopted as more economical and efficient.

Fifty feet of invert and 50 ft. of arch are poured in alternate headings daily or in any one heading on alternate days. Concreting is done only on the day shift, and 50 ft. of invert and 50 ft. of arch are poured per shift. In each invert pour there is 100 cu. yd. of concrete, and in each arch pour 225 cu. yd.

Contracts One and Two are held by the S. A. Healy Co. and Contracts Three and Four by S. A. Healy and Peter Kiewit Sons Co. Wm. Ragland is superintendent of Contracts One and Two; Merle Miller for Contracts Three and Four. For the Sanitary District of Chicago, Joseph H. Richmond holds the position of resident engineer.

Army Tests Instruments To Improve Mapping

Contour maps of superior accuracy can be produced from aerial photographs with a type A 6 autograph now being installed at the Engineer Research and Development Laboratories, Fort Belvoir, Va. Addition of the new autograph, made in Switzerland, is said to give the laboratories the most complete collection of stereo-optical plotting instruments in this country.

Later this fall, the laboratories plan to add a second Swiss autograph —even more accurate than the type A 6—and a new U. S.-built plotter.

In using the type A 6 instrument, each of the operator's eyes observes through an optical system one of a pair of overlapping aerial photographs. After adjustment to make corresponding points on the photographs agree, the operator traces contours and other features of the model by observing a "floating" mark in the optical system. Simultaneously, a map is traced with a pantographic mechanism attached to the plotter. The pantographic attachment allows variation in map scale.

German and French stereos tested

In addition to the autograph, the Fort Belvoir installation includes a stereoplanigraph built by Zeiss and captured from the Germans, two French stereotopographs of different types put in earlier this year, and various modifications of the U. S.-made multiplex apparatus that is now standard Army equipment.

All these machines are undergoing comparative engineering tests at the laboratories to develop data for ultimate standardization of similar instruments if the need should arise.

READER COMMENT

Bricklayer Apprentices

Sir: Reference is made to your article, "Apprentices seen only hope for sick bricklaying craft." (*ENR* Oct. 7, 1948, p. 5).

I believe this is a subject deserving of the most thoughtful consideration.

There are few building materials that can feel assured of continuing widespread use regardless of their cost as parts of finished structures.

The field of research is in its infancy in devising products which not only threaten the supremacy of many existing products but provide adequate substitutes for a growing list at lower cost.

This fact should stimulate some prayerful thinking on the part of those interested in building products whose continuing increase in cost tends to stimulate a desire for lower cost substitutes.

In many cases this involves problems related to a scarcity of skilled labor, as well as questions as to adequate productivity.

Improvement in both of these factors are important in reducing the cost and encouraging the use of the products affected.

THEODORE IRVING COE
Technical Secretary
American Institute of Architects
Washington, D. C.

A Correction

Sir: In the Sept. 16 issue of *Engineering News-Record*, there is an important error in the article, "Swimming-Pool Sanitation Practice."

This error is in the first sentence of the fourth paragraph, as follows: "Bacteriological analyses to determine if the 'coliform count' is less than 100 per milliliter—the Rockford health department standard for swimming pools—are made by the same procedures employed for drinking water." In place of 'coliform count' the sentence should read 'total bacteria count'.

The standard for total-bacteria count is not more than 100 bacteria per milliliter. The standard for coliform bacteria, which is indicative of pollution, is not more than one coliform bacteria in 100 ml. of water. A standard of not to exceed 100 coliforms per ml. as indicated in the article would at its maximum present 10,000 times the number of such bacteria that are actually allowed to be present.

It is probable that only those individuals who are familiar with water analysis would interpret the significance of this error and place a wrong construction upon it. It is also true that many engineers do understand the interpretation of bacteriological tests on water.

A coliform standard of less than 100 per milliliter would represent highly polluted swimming-pool water.

N. O. GUNDERSON
Commissioner of Health
Rockford, Ill.

Wire Breaks on Alaska Bridges

Sir: It is of interest to note in connection with the wire failures in the cables of two recently built suspension bridges, reported in the article "Cable Vibration on Alaska Bridges" (ENR Sept.2,1948), that the harmful effect of the sharp kinks at the locations of the suspender clamps could have been determined at the time of the design of these structures. Not only the photograph on p. 79, but also the literature concerning bridges of this type indicate that kinks such as in these two bridges were never before introduced into the cables of any suspension bridge.

The spacing of the suspenders in bridges having cables of this type, like the St. Vincent bridge, Santos; Rio Paranahyba bridge; Rio de Janerio bridge; Elbe River bridge, Magdeburg; proposed Rhine River bridge, Köln (1910); Chiriqui River bridge, Panama and Rio Choluteca bridge, Honduras, have suspender spacings between 16.4 ft. and 25.2 ft. The Lempa River bridge, El Salvador, has 32.8 ft. spacing whereas the suspender spacing in the Alaska bridges is 38.67 ft. despite the fact they are exposed to temperatures as low as 70 deg. below zero.

Calculations and numerous tests, made especially in connection with the design of cableways, indicate that the stress in the wires of a cable may increase 300 percent due to kinks, depending on the construction of the strands. The friction between the wires in each strand and also the grouping of the strands in the cable affect the magnitude of the stresses additional to the normal cable tension.

The stresses in the cables of these Alaska bridges at the locations of the suspender clamps exceeded, most likely, the allowed stresses very considerably due to dead load alone without the effect of the vibrations. Cable vibrations were extensively studied at the time of the design of these two bridges. Available knowledge should have cautioned in the selection of a suspender spacing considerably longer than used before on any bridge with this type of cables.

The calculation of the stresses resulting in a cable under a given tension produced by a certain type of clamp transmitting given concentrated loads at given spacing is possible if the friction between the wires in the strands is known. Such friction is a function also of the temperature. The data required to make a safe design was, therefore, not difficult to obtain. Attention was directed to the requirements of proper clamp design for such cables many years ago.

LOUIS BALOG
Consulting Engineer
Binghamton, N. Y.

Genissiat Dam

Sir: Your issue of June 24, 1948 brought an excellent article and editorial on Genissiat Dam. In them you claim that no outside aid, machinery, materials or money were used for the project. It is my understanding that the World Bank loaned money to the French for the completion of this project. Usually such a loan would be made to purchase machinery and equipment outside of France.

CARLOS S. OSPINA
Olarte, Ospina, Arias & Payan,
Engineers, Cai, Colombia

Editor's Note: The World Bank reports that no French loan money has been used on Genissiat Dam. It was a French job from beginning to end.

BOOK REVIEWS

Water Supply—A Chronicle

THE QUEST FOR PURE WATER—By M. N. Baker. 527 pp. American Water Works Assoc., 500 Fifth Avenue, N. Y. $5.

Indefatigable research by a man possessed with a passion for accurate reporting has produced one of the notable engineering reference books of our time. In "The Quest for Pure Water". M. N. Baker has given us a history so organized and richly documented that in any future quests for information on water-purification practice the paths of the past can be easily traced.

Mr. Baker tells us that it took nine years to gather and assemble the data for his book. Those who know "MN" —and the number is legion—will recognize this as a modest understatement. It may be properly said that this book had its genesis in 1887, when Mr. Baker joined the staff of *Engineering News*. Among his editorial duties he pioneered the compilation of a "Manual of American Waterworks". This appeared annually for a number of years and was the only source book of information on the then rapidly developing practice of municipal water service.

Examining the records of man's interest in improving water quality, Mr. Baker takes us back to 2000 B. C. In Sanskrit medical lore we are told, "It is good to keep water in copper vessels, to expose it to sunlight, and filter through charcoal". Almost forty centuries later, as revealed in a closing chapter, there is good reason for lauding the usefulness today of charcoal in the form of activated carbon for producing better water.

In the 22 chapters that comprise the book every form of water treatment is discussed. Major emphasis, of course, falls on filtration methods, the development of which first captured the attention of philosophers and later became the obsession of scores of inventors and engineers. The final chapter is devoted to mass medication by means of water supply, a topic that is uppermost in the minds of those who today are charged with water treatment practices.

Mr. Baker, who will be 85 next January, can take the richest satisfaction in having produced a remarkably useful book. And The American Water Works Association, of which Mr. Baker is an honorary member, is to be congratulated for having inspired and made possible the publication of this work.

More Conservation Needed

OUR PLUNDERED PLANET—By Fairfield Osborn. 217 pp. Little, Brown and Co., Boston. $2.50.

ROAD TO SURVIVAL—By William Vogt. 336 pp. William Sloane Associates, New York. $4.

Both these books are directed toward the same objective, that of arousing general concern over the rate at which the world is using up its natural resources and destroying the productivity of its soils while steadily increasing its population. They are of interest to engineers because they call for more complete control of floods than is currently practiced, beginning at the headwaters by checking the loss of both soil and water, and because they recommend that we develop means whereby the organic matter that we now waste or burn at sewage and refuse disposal plants can be returned to the land to help maintain its productivity.

Fairfield Osborn's book is smaller and less detailed and is centered on conservation and restoration of the "natural life-giving elements of the earth." Mr. Osborn does not discuss the effect of population increase in great detail.

William Vogt, on the other hand, lays major stress on the need for checking the rate of population increase, citing the alarming increase in the number of countries that do not now have arable land enough to feed their people adequately.

Mr. Vogt is intemperate and unfair in his criticism of the Army Engineers and the Bureau of Reclamation for the way they have handled the flood-control and water conservation work assigned to them. He completely ignores the fact that both are agencies of Congress and ultimately of the people. Until the people and the Congress are convinced of the need for beginning flood control high up on the tributaries and on *every farmer's hillsides*, and at a cost in time and money that staggers the imagination, the Army Engineers cannot justly be condemned for attempting to mitigate flood damage by levees and storage reservoirs. Also, Mr. Vogt shows how superficial is his knowledge of river regulation when he implies that levees and storage reservoirs would not still be necessary after all the contour plowing, erosion control and reforestation that he visualizes has been done. No amount of that work can keep the Mississippi from overflowing its banks below Cairo, Ill.; and as flood reduction through modification of land-use practices would require decades of education and work to become effective, levees still are the only practical solution for the flood problems of the Mississippi and many other rivers.

Either book warrants study by every engineer who is willing to give thought to the best means for conserving the world's limited resources.

Epic Dike Building

ROLL BACK THE SEA—By A. D. Doolaard. 437 pp. Simon & Schuster, Rockefeller Center, New York. $2.95.

This is a rare book, a novel in which the principal characters are an engineer and a contractor and in which the action centers on one of the most spectacular construction operations of recent years. It concerns the reclamation from the sea of the Dutch island of Walcheren whose great dikes were breached by British bombs in order to drive the Germans from a position that blocked the Allied approach to the post of Antwerp.

Factual modern history, it is written by the man who served as liaison officer between the British Royal Engineers, who supplied aid in the form of materials and some equipment, and the Dutch Department of Dike repairs, which did the work. And it is written in such a way, and in such language, as to have drawn high praise from professional literary reviewers, both here and abroad.

Although rated as a novel, the book is more of a character study of engineers and construction men engaged in the type of activity for which the Dutch are justly noted, and which, in this instance, tested their ingenuity and courage even more than the famous Zuider Zee reclamation job.

The battles to close the four great

gaps in the dikes, in which hydraulic dredges, fascine mattresses, and even the great concrete caissons built for the floating harbors used in the Normandy landings, figure prominently, will hold the interest of any construction man who has had to fight flood waters or seacoast tides and storms.

War Construction History

Building the Navy's Bases in World War II. Bureau of Yards and Docks, Navy Department. Vol. 1, 447 pp.; Vol. II, 522 pp. Superintendent of Documents, Washington, D.C. $3.25; $3.75, respectively.

In transmitting this work to Secretary James Forrestal. Rear Admiral John J. Manning. Chief of the Bureau of Yards and Docks. calls it a report prepared ". . . as a matter of permanent record and for future guidance."

The permanent record. amply illustrated. covers World War II activities of the Civil Engineer Corps and the bureau. Most of the chapters are devoted to the end product of CEC and bureau responsibilities. $8 billion worth of construction at naval shore stations. but a few chapters cover the administrative. logistic. training and other functions that the bureau performed in order to accomplish actual construction.

Enhancing the permanent record's value as a guide to the future. the book relates all of the bureau's functions to causative factors. such as world events. legislative and executive decisions. wartime expedients and even construction site conditions.

It is no accident that the Bureau of Yards and Docks has produced a construction history that thus is tied usefully into the larger picture. In 1944. Admiral Ben Moreell. then chief of the bureau. feeling that the Bureau of Yards and Docks history should be an expository text for future naval civil engineers as well as a chronological presentation of facts, sought a head for the project who had had experience in the field of large-scale planning and general affairs as well as in engineering. Frank W. Herring. a former assistant director of the National Resources Planning Board and a former staff member of *Engineering News-Record,* was Admiral Moreell's choice.

Aided by a staff of Civil Engineer Corps officers and WAVES. Commander Herring first framed a calendar of prewar and war events. Upon this framework he hung successively the Navy's defense and war plans, Navy budget recommendations, Congressional appropriations for construction, Bureau of Yards and Docks procedures, and actual construction. He split the project into three sections that became separate parts of the book: The war program and its direction; the continental bases; the advance bases.

The first section, about 150 pages of Vol. 1. contains most of the world-event and administrative information. in chapters on planning. financing. bureau organization. special-contract problems, advance base equipment and logistics, and the Seabees. However. the world-event and subsidiary threads. as they affected individual construction programs. types and localities. also are carried through the chapters of the second and third sections.

Continental bases are covered in the remainder of Vol. 1, by type of station. i.e.. air stations, navy yards, hospitals, etc.

Vol. 2 is devoted entirely to construction outside continental United States. where about a third of the money was spent. Each chapter tells the construction story of a major war area. The areas range from eastern Europe to the southwest Pacific and from Alaska to South America. Construction battalion reports were the primary information sources. An 8-page appendix lists the active duty dates and places of operation for all construction brigades. regiments and battalions, maintenance units. detachments. special battalions and pontoon assembly detachments.

Mechanical Handling

Material Handling—A manual for warehousing and shipping. 92 pp. General Electric Co. Schenectady, N. Y. $1.

Prepared for those concerned with handling materials in the receiving, warehousing and shipping phases of industry. this manual covers handling equipment and applications. handling surveys, and equipment engineering data. Almost none of the equipment items is a product of the General Electric Co., but almost all are electric-powered. It is the book's contention that full possibilities of mechanical material handling should be understood by a host of small operators whose obsolete handling methods are weighting product costs unnecessarily.

While the book makes no suggestions directly to the construction industry, it implies up-to-date storage methods for large jobs, and it gives engineering data for the conveyors which some contractors now are using for bulk material handling and excavation.

New Engineering Books

Surveying Instruments—By Edmond R. Kiely. 411 pp. Bureau of Publications, Teachers College, Columbia University, New York. $3.

Physical Geology—Third Edition—By C. R. Longwell, A. Knopf, and R. F. Flint. 602 pp. John Wiley & Sons, New York 16. Chapman & Hall, London. $5.

Michigan and the Cleveland Era—Sketches of University of Michigan Staff Members and Alumni. Edited by Earl D. Babst and Lewis G. Vander Velde. 372 pp. The University of Michigan Press, Ann Arbor, Mich. $2.50.

Business, Legal, and Ethical Phases of Engineering—By D. T. Canfield, and J. H. Bowman. 358 pp. McGraw-Hill Book Co., New York 18, and London. $4.50.

Plasticity as a Factor in the Design of Dense Bituminous Road Carpets—By L. W. Nijboer. 184 pp. Elsevier Publishing Co., Inc., New York 3, and Amsterdam. $5.25.

Ingenieurgeologie—Part II—By Ludwig Bendel. 832 pp. Springer-Verlag Molkerbastei 5, Wein 1, Austria. $31.50.

The Columbia River—A Comprehensive Report on the Development of the Water Resources of the Columbia River Basin for Irrigation, Power Production, and Other Beneficial Uses in Idaho, Montana. Nevada, Oregon, Utah, Washington, and Wyoming. By The Bureau of Reclamation. 399 pp. Obtainable from the Information Division, Bureau of Reclamation, Box 937, Boise, Idaho.

American Wood-Preservers' Association Manual of Recommended Practice—By American Wood-Preservers' Association, 1427 Eye St., N. W., Washington 5, D. C. $5.

National Electrical Safety Code—National Bureau of Standards Handbook H30. By National Bureau of Standards. 408 pp. For sale by the Superintendent of Documents, Washington 25, D. C. $1.25.

Simplified Design of Structural Timber—By Harry Parker, M. S. 218 pp. John Wiley & Sons, New York 16. Chapman & Hall, London. $3.25.

(*Continued on page* 160)

"Give us the tools..."

TO SURVIVE

America Must Have Better Tools

IN THE past twenty years the United States has failed to provide its workers with enough new tools and equipment.

To most Americans this statement will come as a shock – or will be doubted. We are quite complacent about our industrial equipment, for easily understood reasons.

Throughout the '30s we heard continuously the propaganda line that the United States had become a "mature economy." The job of equipping America with industrial plants and tools was said to be largely done.

Now, knowing that industry is spending billions to expand and rebuild its plants, many people assume that the result must be a first-class industrial system.

A further powerful inducement to complacency is the vastly *worse* industrial condition of most of the rest of the world. When Americans look abroad in almost any direction they see shattered plants and equipment. A natural reaction is that we are sitting pretty.

That is a dangerous reaction. Between depression and war, we have failed to build the tools and equipment we need. This condition is dangerous for three reasons:

1. *From bitter experience we know that national security depends first and foremost on the capacity and readiness of our industrial equipment.*

All of our plans for stabilizing prosperity assume a world at peace. The greatest menace to peace would be an unarmed America, unable or unwilling to keep herself strong and ready for defense – strong in spirit, in resources and in the all-important industrial plant and equipment.

2. *Whether Americans live well – or badly – depends directly on the kind and quality of tools used by American workmen.*

This is true for all workers, and for every worker – from a garage mechanic and his wrenches to a steel mill gang and its rolling equipment. In a monumental study of "America's Needs and Resources" the Twentieth Century Fund found this fact: The improvement in the real income of the American people has more consistently followed the amount of power used in industry than anything else. What the workman worked *with* determined, more than any other factor, the size of his pay envelope, and what it would buy.

3. *Our success in stabilizing prosperity will depend largely on what we do about building new tools and equipment.*

About 30% of our industrial workers are employed in producing tools and equipment. Steady employment for them is essential to our over-all prosperity.

How far have we fallen behind in providing new plants and equipment?

Estimates vary. Here is one rough estimate: If we had built new industrial facilities during 1930-48 at the rate we did in the prosperous '20s, we would have spent at least $100 billion more than actually we did.

To get a better and more complete measure of this deficit, McGraw-Hill is undertaking a survey of American Business' Needs for New Plant and Equipment.

Businessmen all over the nation are being asked to answer questions like this: How much money would you need to put your plant in first class condition? How much are you planning to spend for new plant and equipment? Where do you expect to raise the money? The results will be reported later in this editorial series. Already the survey shows we have fallen many billions of dollars behind.

Some shortcomings are apparent to everyone. They are revealed in a lot of rickety transportation facilities and in rundown buildings.

Many other deficiencies do not come into general view. They are, for example, the antiquated machines in our plants. Of the privately-owned machine tools in use in 1945 – when the last census of metalworking equipment was made by AMERICAN MACHINIST – 54% were more than 10 years old. Their average age is higher today.

It is true that in recent years we have hit new highs in total national production. But we have done so by putting far more people to work than ever worked before . . . and by driving equipment to the limit of its waning endurance, sometimes beyond. It has not been done *primarily* in what is by all odds the best way to increase production—to use more and better and more modern tools and equipment.

Haven't we overcome much of this twenty-year deficit by rushing to build new plants since the end of the war?

No. For two clear-cut reasons:

1. The accumulated shortage is tremendous. The total of about $40 billion, which has been spent for industrial plant and equipment since VJ-Day, has not wiped it out.

2. Some key industries have had difficulty in getting the facilities they need. Take steel, for example – the industry that turns out our most basic industrial material. Its needs for new equipment are measured in billions of dollars. To pay for that equipment, it should have *risk capital* – money which people are willing to invest with a risk of losing for the sake of gain. For steel is an up-and-down industry. Earnings on its common stocks inevitably share both ways in those ups-and-downs.

Since the war, steel, in common with most of industry, has been unable to market new common stock successfully. Its outstanding stock is now selling for only about one-half the current net worth of the industry's present assets. With investors willing to pay only 50 cents on the dollar for its facilities, the industry can not readily sell stock to pay for *new* plant and equipment – at higher prices even than the old.

Why can't steel – and other industries – attract people who are willing to risk their money retooling America?

The full answer to that serious question must be left to future editorials in this series, for it involves many things . . . tax reform . . . mobilization of small savings . . . a new respect for corporate profits.

This first editorial seeks simply to emphasize two fundamentals:

First, our standard of living improves with the *quality* of our industrial equipment.

Second, American industry and American workmen badly need billions of dollars worth of better equipment *now*.

The American people must understand that *not only our continued prosperity but also our security as a nation depends upon giving American industry more and better equipment.*

"Give us the tools." This was Winston Churchill's cry for help to win the war. Only if we give American industry new and better tools will we have a chance to win abiding prosperity at home and good order abroad.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

★ THIS EDITORIAL, and a series to follow, will be devoted to a single problem – how to provide American industry with the equipment needed to improve that envy of the world, the American standard of living. No more important problem confronts us today. Upon our wisdom in handling it depends not only the degree of our prosperity, but also our security as a nation.

THIS IS THE 69TH OF A SERIES

Look into PITTSBURGH DISC METERS

CHECK ✓ THESE QUALITY FEATURES

✓ **REGISTERS WITH SWEEP DIAL TEST HANDS**

Both circular and straight reading registers have large red center test hands to permit close reading when checking meters for accuracy.

✓ **ENCLOSED GEAR TRAINS**

Quiet, slow running design. Accurately cut gears and spindles, hard rubber bushed.

✓ **SNAP JOINT MEASURING CHAMBERS**

Accurately machined in two parts, held together without screws by mating snap joint to simplify maintenance operations.

✓ **THREE PART, REINFORCED DISC**

The reinforced disc plate and two half balls are individually molded from hard rubber. Construction permits economical replacement of any individual part.

✓ **UNIT ASSEMBLY OF WORKING PARTS**

Permits checking freedom of movement and alignment of the entire working mechanism *before* the meter is bolted together.

FOR COLD CLIMATES

ARCTIC TYPE
A BRONZE METER WITH BREAKABLE FROST BOTTOM

FOR WARM CLIMATES

TROPIC TYPE
ALL BRONZE
SPLIT CASE CONSTRUCTION

ROCKWELL

PITTSBURGH EQUITABLE METER DIVISION
Rockwell Manufacturing Company
Pittsburgh 8, Pa.
Atlanta Boston Chicago Houston Kansas City Los Angeles
New York Pittsburgh San Francisco Seattle Tulsa

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

December Materials and Labor Prices will appear in the December 9, 1948 issue

CEMENT, AGGREGATE, READY-MIXED CONCRETE — F. O. B. CITY

	PORTLAND CEMENT*			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE BLOCK		CONCRETE
	Per bbl. C/L lots incl. $1.00 per bbl. for bags, cash. dis. not deducted			Per ton, carload lots			Per ton, carload lots		Per ton, carload lots, f.o.b. plant		8x8x16-in.; truckload del.; per block		Ready Mixed 1:2:4 over 50 c.y., del.
	Cloth	Paper	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand grav.	Lt.wgt.Agg.	
Atlanta	$4.11	$3.34	$3.05	$2.00	$2.00	$1.75	$2.10	$2.10	$1.65	$1.85	$0.1725	$0.1725	$11.00
Baltimore	4.12	3.37	3.06	2.30fft	2.30fft	1.95fft	2.60fft	2.70fft	2.45fft	2.45fft	.16	.16w	9.85
Birmingham	3.80	3.05	....	2.06	2.06	1.66	2.50	2.50	1.00	1.20	.165	.165	7.75
Boston	4.44	3.69	3.38	2.50t	2.50t	2.50t	1.50t	1.60t	....	....	.17	.185w	10.50m
Chicago	3.61/3.67	2.86/2.92	2.56/2.62	2.75‡d	2.75‡d	3.20‡d	2.75‡d	2.75‡d	2.00‡	2.00‡	.20	.20x	....
Cincinnati	4.00	3.23	2.94	1.85‡pp	1.85‡pp	1.75‡pp	2.95‡bb	2.95‡bb	2.30	2.30	.19	.195	10.40hh
Cleveland	3.92	3.17	2.82	1.90llig	1.65llg	1.55ll	3.55‡h	3.55‡h	2.60	2.60	....	.21	11.80aa
Dallas	3.57	2.82	2.52	2.00	2.15	1.75	2.10	2.15	....	....	.0775p	.285	8.85
Denver	.....	3.59	3.29	1.85	2.00	1.15	....	....	....	....	.20	.23w	9.65
Detroit	3.98	3.20	2.92	3.25‡	3.25‡	3.00‡	3.00‡	3.00‡	3.00‡	3.00‡	.17	.18w	10.05kk
Kansas City	....	....	....	2.05	2.05	1.50/1.80t	1.45q	1.45q	....	....	.17wf	....	9.85n
Los Angeles	....	3.72b	3.34b	1.92t	2.02t	1.72tnn	1.92t	1.92t	....	....	.085oo	....	9.96m
Minneapolis	4.05dd	3.30dd	3.00dd	2.30h‡j	2.30h‡j	1.35h‡j	2.50h‡j	2.50h‡j	....	....	.21cco	....	10.70jkk
Montreal	....	2.39rqq	2.24rqq	....	1.95bbs	...	.85cs	1.10cs	....	....	.177rr	.1665wrr	8.95ls
New Orleans	....	2.88	2.60	2.32	2.32	1.82	....	....	.90	1.15	.23	....	10.65
New York	....	3.90/4.40‡	....	2.00de	2.00de	1.45de	2.00dv	2.00dv	....	....	.18ii	.18wccii	10.30k
Philadelphia	4.15‡	3.40‡	3.10‡	2.30‡	2.40‡	2.05‡	1.90‡	1.95‡	1.50	1.50	.18/.22	.18/.22w	9.85
Pittsburgh	4.25†	3.40†	3.15†	2.05‡	2.05‡	2.35‡	2.50‡	2.50‡	2.05	2.05	.23z	.23z	11.50
St. Louis	3.80o	3.05o	2.75o	2.60‡oh	2.40‡oh	2.00/2.40‡oh	1.50c	1.50c	1.10	1.15	.225	.23yo	10.40
San Francisco	.....	3.38	2.98	1.84	1.84	1.94	1.94	....	....	....	....	.25y	10.75u
Seattle	.....	3.45mm	2.95mm	2.75‡od	2.75‡od	2.75‡od	3.50‡od	3.50‡od	....	....	.22o	....	9.75o

‡ Delivered. *a* F.o.b. truck at plant. *b* 10c. per bbl. off for payment by 10th of following month. *c* F.o.b. quarry. *d* Per cu. yd. *e* Barge lots alongside docks, Man. *f* F.o.b. truck on job. *g* Pea gravel. *h* Truck Lots. *i* ½ in. *j* 5% discount for cash. *k* 5 cu. yds. or over, del. Man. *l* 2000 lb. concrete. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 5¼ x 8 x 12 in. *q* F.o.b. truck at plant. *r* 10c per bbl. off cash 20 days. *s* Sales tax included. *t* Truck delivery. *u* 10 to 100 c.y. brackets. *v* F.o.b. scow, Hudson River, N. Y. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Aver. haul, 7-9 mi. zone. *bb* Under 5 tons. *cc* 8 x 8 x 18 in., also. *dd* Dealers sell only in LCL. This is price for CL and does not include dealer's commission. *ee* 20c refund for ea returnable bar. *ff* LCL. *gg* 10c. refund for each returnable bag. *hh* Tru loads up to 500 c.y. Over 500 c.y. lots, 50¢ less per yd. *ii* Yard pric *kk* 2500 lb. compression strength. *jj* 30¢ refund for each returnable ba *ll* Price at plant, called for. *mm* 10¢ per bbl. off cash 10 days. *nn* Concre sand. *oo* 4 x 8 x 12 std. wgt. *pp* 5 tons or more. *qq* Dealer's commissi not included. *rr* F.o.b. * Prices include dealer's commission except whe indicated to the contrary. † Prices not stable.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discou 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES AT CEMENT MILLS

Charge for bags not included. For cloth bags, add $1.05 per bbl.; 25¢ refund allowed for each returnable bag; for paper bags add 28¢-30¢ per bbl., not refundabl

	Bulk		Bulk		Bulk		Bulk		Bulk
Richard City, Tenn.	$2.40	Buffington, Ind	$2.20	Steelton, Minn	$2.40	Muskegon, Mich	$2.40	Cleveland, O	$2.4
Clinchfield, Ga	2.40	Independence, Kan	2.30	Leeds, Ala.	2.25	Saginaw, Mich	2.35	Toledo, O	2.4
Kingsport, Tenn	2.40	Hannibal, Mo	2.20	Duluth, Minn	2.40	Wyandotte, Mich	2.30	Milwaukee, Wis	2.4
West Des Moines, Iowa	2.30	Northampton, Pa	2.30	Hudson, N. Y	2.30	Buffalo, N. Y	2.40	Ironton, O	2.2
Nazareth, Pa	2.30	Universal, Pa	2.20	Alpena, Mich	2.25	Oswego, N. Y	2.40	Montreal City	2.0
Bath, Pa	2.30	Waco, Tex(+ 9¢ tax)	2.20	Detroit, Mich	2.40				

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS — F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OIL	ASPHALT EMULSION	
	Granite per M lots of 50,000 4x4x8 in.	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Per ton, less than 80 penetration		Per gal., 80–300 penetration		Per ton		Per gal.	(Quick-breaking) Per gal.	
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$35.00	$2.25	......	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore	150.00‡	52.70‡	.....	$23.00	.....	$.095	$0.15	$.095h	$.17h	$.095v	$.095	$0.115
Birmingham	......	32.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	.....	.....	.....	23.00o	$34.00o	.0936o	.175o	.095ho	.185ho	.095o	.103o	.195o
Chicago	150.00‡y	85.00/88.00e‡	3.10/4.15d‡	22.50b	32.00b	21.50bg	31.00bg	.097/.10bh	.....	.082/.0845b	.0925/.1025b	.14/.165b
Cincinnati	.....	.....	.....	24.50ff	.....	.1035	.....	.1035h	.....	.....	.....	.....
Cleveland	190.00	49.00t	3.87u	30.00	40.00	29.50g	39.50g	.135h	.22h	.14	.20	.27
Dallas	l	40.00	l	23.38	42.17	.0987	.1837	26.15	46.65	.0962	.1037	....
Denver	.....	41.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	....	.....	.....	27.00	26.00	18.40g	24.40g	.0811h	.128h	.075	.1085	.152
Kansas City	.....	40.00q	.....	20.45r	.....	.....	.....	.081hr	.....	.071r	.....	.....
Los Angeles	l	.....	l	17.50mf	32.00mfw	17.50gm	32.00mw	18.50m	25.50mw	17.00gm	.075cc	.145cc
Minneapolis	.....	......	2.79d	28.00	37.00	23.00g	34.00g	27.00	38.00	.105	.13	.23
Montreal	140.00	......	.....	25.00k	34.65k	15.70kp	19.95kp	15.30kp	17.30kp	14.20kj	.174k	.215k
New Orleans	.....	.....	.....	20.00a	.....s	20.00ga	.....s	.095hadd	.....s	.095	.0975	.16n
New York	.....	.....	2.50d	26.50	38.86	25.50g	44.88g	.1090h	.1917h	.1040	.1090	.189
Philadelphia	150.00	75.00	4.06	23.00	.....	22.00g	.....	.095h	.....	.....	.....	.....
Pittsburgh	165.00	42.00	4.50	26.00	39.00	.12	.24	27.00	40.00	.095	.10	.21
St. Louis	.....	.....	.....	21.40	.....	.....	.....	.....	.....	.....	.1025	...
San Francisco	.....	57.75c	.....	17.50ee	32.00wee	17.50geeff	.....	19.50ee	.....	.....	.0725	.1425
Seattle	.....	.....	.....	17.50i	36.75i	17.00ig	.....	19.50i	23.50aai	18.00ig	.075i	.09

‡ Delivered. *a* F.o.b. Baton Rouge. *b* F.o.b. refinery. *c* 2⅜ x 8¼ x 4 in. *d* 2-in. interior block, 6-lb. treatment. *e* 3½ x 4 x 8½. *f* 40–80 penetration. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* Shipped in drums, per drum. *k* Tax included. *l* Not used. *m* F.o.b. refinery, El Segundo. *n* 55 gal. drums. *o* Price at plant, in Everett. *p* Per 100 gal. *q* F.o.b. Buffalo. *r* F.o.b. Sugar Creek, Mo. *s* Drums not available. *t* Truck deliveries in Greater Cleveland. *u* 3-in. *v* Bulk, refinery. *w* Shipped in steel barrel no longer in double head wood barrels. *x* Truck deliveries in Detroit $75.0 *y* Carload lots. *aa* In customer's drums. *cc* F.o.b. refinery, Inglewoo *dd* Medium curing. Rapid curing, $.0975; slow curing, $.0925. *ee* F.o. Richmond. *ff* 50-300 penetration.

Research keeps
B.F. Goodrich
FIRST IN RUBBER

Ever skid with an 80-ton load?

A typical example of B. F. Goodrich improvement in tires

In strip mining coal, huge trucks, often the size of a railroad car, haul the coal from the digging pits many miles over improvised roads. Sharp rocks, shale and coal slash at the tires as they roll along. When wet, the thick clay underfoot often makes the pits slippery. Trucks used to slide, slip and bog down in this kind of going.

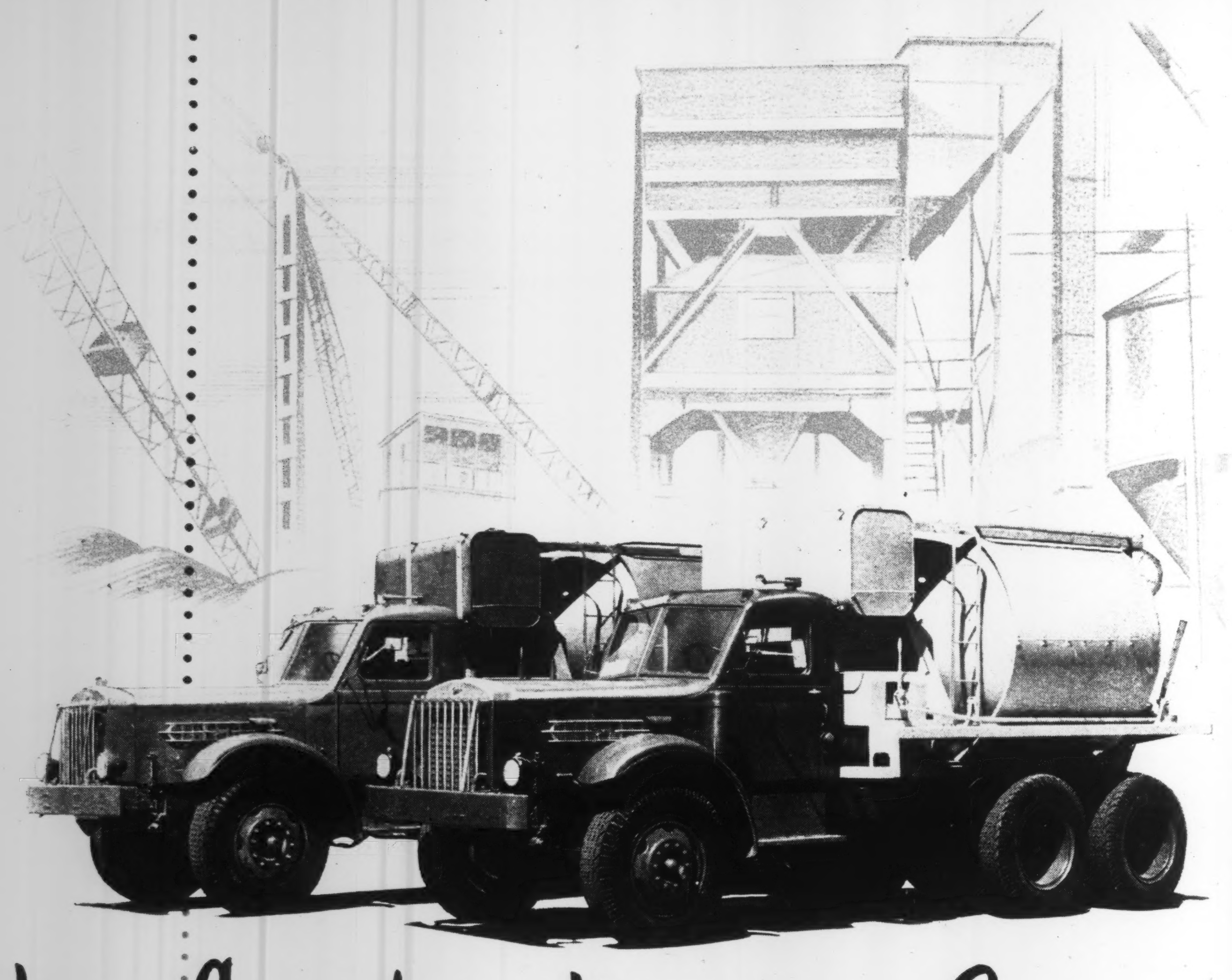
To meet this traction problem and at the same time provide protection against tread cutting, B. F. Goodrich engineers studied mine conditions, designed a special tread which prevents side slipping and resists cutting. In the picture a Kansas mine superintendent examines this type B. F. Goodrich tire on an 80-ton truck ready for a day's hauling.

In addition this tire has the protection of a nylon shock shield—layers of elastic nylon cord under the tread. This shock shield protects the tire body against impacts and bruises, lengthens tire life, makes more tires recappable.

Mine operators have said this tire gives them better service than they have ever received before.

Helping anyone who has a transportation problem is typical of the work of B. F. Goodrich engineers. They have developed special truck tires for many purposes, and improved truck tires for all purposes. Today, every B. F. Goodrich truck tire in sizes 8.25 and up for use either off or on the highway is built with a nylon shock shield. Truck tires with the nylon shock shield can be secured from your B. F. Goodrich dealer at no extra cost. *The B. F. Goodrich Company, Akron, Ohio.*

Truck Tires BY
B. F. Goodrich



More Concrete — Maximum Economy

with **Sterling** heavy duty motor trucks

Many satisfied contractors throughout the United States have made Sterling heavy duty motor trucks their choice for efficient heavy duty service.

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Write Sterling Motors Corporation, Milwaukee, Wisconsin or contact your nearest Sterling representative for additional information on the wide variety of Sterling models that are available.

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- Gasoline
- Diesel
- Four Wheel
- Six Wheel
- Multi Wheel Drive (4x4 and 6x6)

STERLING MOTORS CORPORATION
Milwaukee
1,
Wisconsin

BRANCHES AND DEALERS IN PRINCIPAL CITIES

IRON AND STEEL PRODUCTS—PER 100 LBS. BASE MILL PRICES

	STRUCT. SHAPES–PLATE	REINF. BARS Billet ab	RIVETS ½-in. structural	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	STEEL RAILS Light c	STEEL RAILS Re-rolled	TRACK SUPPLIES Angle Bars	TRACK SUPPLIES Std Spikes	TRACK SUPPLIES Tie Plates	TRACK SUPPLIES Track Bolts d
Birmingham Area	$3.25	$3.35	$6.75	....	$64.00	$71.00/85.00	Not	$4.25	$5.35	$4.05	....
Chicago Area	3.25	3.35	6.75	$4.05	64.00	71.00/85.00	avail-	4.25	5.35	4.05	....
Pittsburgh Area	3.25	3.35	6.75	4.05	64.00	71.00/85.00	able	4.25	5.25	4.05	....
Buffalo Area	3.30	3.35	6.75	4.05	64.00	71.00/85.00	....	4.25	5.35	4.05	$8.50
Cleveland	....	....	6.75	....	.....	.....	....	....	....	....	8.50
Youngstown Area	....	3.35	....	....	.....	.....	....	....	5.35	....	....
Geneva	3.25	....	....	....	.....	.....	....	....	....	....	....
Los Angeles	....	4.10	....	....	.....	.....	....	....	5.35	....	....
Pueblo	3.25	3.35	....	....	64.00	71.00/85.00	...	4.25	5.35	4.05	8.50

a To fabricators. To consumers: $4.10 Pittsburgh, Pa.; $4.25 S. Duquesne, Pa. Gary, Ind., Youngstown, O.; $5.00 Seattle, Wash. *b* Rail steel price $4.65; Williamsport, Pa.; $5.25 Huntington, W. Va. Williamsport, Pa. *c* Rail steel $94 per ton *d* Treated. Untreated $8.25.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS*g* Per 100 lb., base price *u* 5 tons to carload lot *b* New billet	REINFORCING BARS Rail steel	REINFORCING BARS Add Switch	REINFORCING BARS $/cwt. for Del.	EXPANDED METAL LATH*k* Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb.	EXPANDED METAL LATH Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING§ Per 100 sq. ft., carload lots 4x16 in., No. 5 & 10 wires	WELDED FABRIC REINFORCING 4x12 in., No. 8 & 12 wires	WELDED FABRIC REINFORCING 6x6 in., No. 6 & 6 wires	SHEET PILING Per 100 lb. base price
Atlanta	$4.75	$5.225*k*	$5.225*k*	$.025	$.10	$31.50	$33.50	F.o.b. Mill: Joliet, Illinois, Donora, Penn., $2.36 Monessen, Penn., $2.40	F.o.b. Mill: Joliet, Illinois, Donora, Penn., $1.63 Monessen, Penn., $1.66	F.o.b. Mill: Joliet, Illinois, Donora, Penn., $2.47 Monessen, Penn., $2.52	...
Baltimore	5.48	4.47*l*	....	....	.10	40.00	43.00				..
Birmingham	5.15	5.15	5.50	.05	.15	43.00*p*	45.50*p*				....
Boston	5.54*k*	5.46*k*	4.84*kc*	....	.10/.15	31.00	33.00				$4.05*a*
Chicago	5.05	4.20/4.70*ff*	4.20/4.70*ff*	.05	....	31.00‡	33.00‡				4.05*a*
Cincinnati	5.60‡*r*	5.55*r*	....	....	....	33.00*zee*	35.00*zee*				4.05*a*
Cleveland	5.45*hh*	4.37*v*	....	....	.10	34.50	36.50				....
Dallas	6.30	6.25	6.25	....	....	33.75	35.75				....
Denver	6.45	6.30*c*	....	....	....	43.00*s*	50.00*qs*				6.39
Detroit	5.45	....	....	....	.10	33.50*x*	35.50*q*				4.462*yee*
Kansas City	6.00	4.75*a*	....	....	....	37.00	39.00				4.65*d*
Los Angeles	5.70*f*	6.10*bb*	....	....	.15	41.00*f*	46.00*kk*				.....
Minneapolis	5.94‡	6.19*ccn*	6.19*ccn*	...	.15	34.50	36.50				4.05*a*
Montreal	5.10*i*	4.70*i*	4.70*i*	....	....	44.10*h*	46.80*h*				79.90*jdgg*
New Orleans	....	5.00*ok*	....	.05	.10	32.00	32.00				.....
New York	5.68*r*	5.75	....	....	.15/.20	34.50*st*	36.50*st*				4.05*a*
Philadelphia	5.04	5.15	....	....	....	30.00‡	32.00‡				....
Pittsburgh	4.40/4.50	4.40/4.50	4.40/4.50	.05	.10	32.50	34.50				....
St. Louis	5.39*k*	5.24*c*	5.24*c*	....	....	42.00*aa*	48.00*aa*				....
San Francisco	5.90*ii*	5.65	. .	....	....	36.50	38.50				5.25
Seattle	4.30*e*	5.25*el*	....	....	....	52.00*s*	42.00*s*				5.31*dd*

‡ **Delivered.** *a* Mill prices. *b* 1–5 tons, add 35c. Less than 1 ton, add 50c. *c* 20 tons or over base. *d* Mill price plus freight. *e* F.o.b. plant. *f* Includes delivery in free delivery zone. *g* High scrap steel prices cut former 15c. differences between new billet and rail steel. *h* List price. Dominion tax exempt. Provincial and Municipal tax extra. *i* Plus Dominion, Provincial and Municipal sales tax. *j* Price per ton. *k* F.o.b. city. *l* Intermediate and hard grade, new billet. *m* Per sq. yd. *n* 5 to 8 tons base. *o* 5 to 15 tons base. *p* Del. of 5000 sq. yd. or less. *q* Std. ribbed. 4 lb. per sq. yd. *r* 5 tons or over. *s* LCL. *t* Asphalt coated. *u* Note: Revised size extra—1 in., 1 1/8 in., 1 1/4 in. 10¢, 7/8 in., 3/4 in. 15¢, 5/8 in. 20¢, 1/2 in. 35¢, 3/8 in. 55¢, 1/4 in. $1.30. *v* Under 20 tons. Straight. *w* Copper bearing. *x* 2.5 lb. per sq. yd. *y* $.0093 transportation tax included. *z* Copper alloy. *aa* Delivered truck to job. Contractor to do unloading. *bb* Includes 55¢ extra for 3/8 in. size. *cc* F.o.b. cars Chic. plus freight. *dd* F.o.b. dock. *ee* F.o.b. cars. *ff* Carload lots. *gg* Including sales tax. *hh* Delivered price is $5.60. *ii* Rolled at Geneva mill. Shapes rolled at Fontana, $6.90. *kk* 3/8" ribbed.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in. *a*	VITRIFIED SEWER PIPE Per foot, Delivered ASTM C13–44T std. 8 in. s.s.	VITRIFIED SEWER PIPE std. 12 in. s.s.	VITRIFIED SEWER PIPE 24 in.	VITRIFIED SEWER PIPE 36 in.	CLAY DRAIN TILE ASTM C4–24 Per 1,000 ft., carload lots, f.o.b. 6 in.	CLAY DRAIN TILE 8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTMC 14–41 12 in.	CONCRETE SEWER PIPE 24 in.
Atlanta	$100.10	$0.43	$0.67	$3.39	$7.00	$114.00	$140.00	$0.45	$2.00
Baltimore	104.50	.378	.729	3.105	8.098	147.00	228.00	.80	2.25
Birmingham	93.50	.40	.72	2.84	....	210.00‡	375.00‡	.90	2.50
Boston	107.90	.441*uvr*	.8505*uvx*	3.87*uvy*	10.36*ury*	173.40	267.60	1.45‡*mg*	3.60‡*mg*
Chicago	106.70	.59	1.14	4.81	13.45	150.00‡	270.00‡	.70	2.35
Cincinnati	105.20	.441	8505	3.51	9.53	154.80‡	241.20‡	.60	2.25
Cleveland	107.30	.357*x*	6885*r*	3.015*r*§	8.405*r*§	147.50	231.00	.65	2.50
Dallas	109.08	.365	.684	2.72	6.25	109.00	131.00	.48	1.55
Denver	113.92	41*dd*	71*dd*	2.98*dd*	....	......	......	.74*dd*	2.50*dd*
Detroit	107.30	.555	1.10	4.20	12.75	195.00‡*m*	303.00‡*m*	.65	2.50
Kansas City	108.42	.418*m*	76*m*	3.00*m*	....	121.00*m*§	418.00*m*	.60*l*	2.00*l*
Los Angeles	120.30	.426	.927	4.532	11.298	193.00‡	324.00‡	.65	...
Minneapolis	110.30	62*mo*	1.12*mo*	4.35*mo*	11.290	......	......	1.23*h*	3.50*h*
Montreal	90.00	.73*s*	1.28*s*	4.20*z*	6.80*es*	.60*p*	.48*p*	72.00*jkaa*	218.00*jkhaz*
New Orleans	103.10	.412	.762	3.955	9.15	231.00*bb*	......	.55	1.95
New York	103.50/108.50	.62	1.14	4.45	12.30	......	......	1.00	2.25
Philadelphia	101.30	.54	.99	4.08	10.25	235.00‡	300.00‡	1.25*h*	3.20*h*
Pittsburgh	107.82	.364*m*	.702*m*	2.70*m*	6.625*m*	130.20	197.40	1.05*h*	2.50*g*
St. Louis	104.60	48	.87	3.42	8.05	......	......	1.10*il*	2.25*hl*
San Francisco	120.30	50*d*	.99*d*	3.96*d*	9.90*d*	188.00*dl*	313.00*dl*	.69	2.85
Seattle	122.10	51*b*	91*b*	....	....	150.00*c*	......	80	2.40

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, CL, Burlington, N. J. (base) $98.50. Based on existing freight rates; subject to rate change. Gas pipe and class A, $5 per ton additional. 4 in., $5 per ton additional, 30 in. and larger, usually $1 per ton less. *b* Extra strength ASTM C 200-44T. *c* 4-in., $90. *d* SS361-A. *e* 30 in. *g* Culvert pipe. Reinforced. ASTM C76-41. *h* Reinforced. ASTM C75-41. *i* Reinforced. ASTM C76-37. *j* Centrispun. *k* Per 100 ft. *l* F.o.b. plant. *m* Truck delivery. *o* Listed price is based on LCL (no minimum). *p* Less than 5 ton loads, price per ft. *t* Within switching limits. *u* ASTM C13-40. *v* F.o.b. city. *x* 2 ft. lengths. *y* 3 ft. lengths. *z* CESA A 60-1941 specifications used. *aa* No standard specifications in Can. *bb* Freight allowed to destination in city. *cc* Truck loads; f.o.b. plant, Newton. *dd* LCL, delivered, f.o.b. truck.

*WROUGHT STEEL PIPE
(Full standard weight)

Mill	2½ & 3 in., Butt Weld† Black %	2½ & 3 in., Butt Weld† Galv. %	3½ to 6 in., Lap Weld† Black %	3½ to 6 in., Lap Weld† Galv. %
Lorain, Pa	50.5	34.5	....	...
Aliquippa, Pa	49.5	30.5	46.5*a*	27*a*
Sparrows Pt., Md	48.5	29.5	42.5	23
Benwood, W. Va	50.5	31.5	44.5	25
Youngstown, O	50.5	31.5	...	...
Indiana Harbor, Ind.	49.5	30.5	42.5	23
Sharon, Pa	48	29	....	...
Wheatland, Pa	49.5	30.5	46.5*a*	27*a*
Etna, Pa	50.5*b*	31.5*b*	44.5	25
Fontana, Calif	19.5*b*	0.5*b*	12.5*ab*	7*ab*

†Threaded and coupled. *a* 3½ to 4 in. *b* Continuous weld.

* WROUGHT STEEL PIPE: Discounts from standard list consumers carload prices. Base price approx. $200 per net ton. List prices per ft.: *Butt Weld:* 1/8 in., 5½¢; 1/4 in., 6¢; 3/8 in., 6¢; 1/2 in., 8½¢; 3/4 in., 11½¢; 1 in., 17¢; 1¼ in., 23¢; 1½ in., 27½¢; 2 in., 37¢; 2½ in., 58½¢.; 3 in., 76½¢. *Lap weld:* 3½ in., 92¢; 4 in., $1.09; 5 in., $1.48; 6 in., $1.92. Freight rates to destination to be added to price, plus 3 percent tax on transportation.

WROUGHT IRON PIPE: List prices per ft. same as wrought steel pipe Discount for Pittsburgh base. *Butt weld*— 1 in. and 1¼ in. black, +4.5, galv. +30; 1½ in. black, 1.5, galv. +26.5; 2 in. black 2, galv. +26. *Lap weld*— 2½ in. to 3½ in. black + 5, galv. +29.5; 4½ in. to 8 in. black + 2, galv. +25. Freight rates to destination to be added to name delivered price.

§ *Correction:* Oct. prices unchanged at November levels.

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F. O. B.

		SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
		1x6 s4s	1x8 s4s	2x4 s4s	2x6 s4s	2x8 s4s	2x10 s4s	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	5/8"	3/4"
Atlanta	*l*	**$70.00**	**$71.00**	**$60.00**	**$62.00**	**$65.00**	**$68.00**	**$70.00**	......	......	......	......	$22.32	$27.24
Baltimore		**90.00**	**95.00**	**92.00**	**95.00**	**95.00**	**98.00**	**115.00**	......	......	175.00	175.00	22.86	27.90
		120.00	*120.00*	*115.00*	*115.00*	*115.00*	*115.00*	*125.00*	*125.00*	*125.00*	......	......	......	......
Birmingham	*l*	**87.50**	**90.50**	**75.00**	**78.00**	**80.00**	**82.50**	**105.00**	......	......	130.00	125.00	21.78	26.58
	l	*80.00*	*80.00*	*75.00*	*75.00*	*75.00*	*75.00*	*85.00*	*85.00*	*85.00*	......	......	......	......
Boston		80.00[3]	80.85[3]	85.00[6]	85.00[6]	85.00[6]	90.00[6]	100.00[6]	......	......	......	......	22.86	27.90
		100.00	*100.00*	*102.00*	*85.00*	*85.00*	*105.00*	*105.00*	*105.00*	*105.00*	105.00	105.00	......	......
Chicago	‡	**87.00**	**92.00**	**77.00**	**82.00**	**84.00**	**90.00**	**97.00**	......	......	117.00	117.00	18.72	22.80
	‡	*100.00*	*105.00*	*97.00*	*97.00*	*97.00*	*102.00*	*102.00*	*102.00*	*102.00*	......	......	......	......
Cincinnati		**100.00**	**108.00**	**105.00**	**110.00**	**108.00**	**110.00**	......	......	......	150.00	150.00	21.78	26.58
Cleveland		**83 84**	**87 89**	**74 78**	**81.00**	**84.50 85.50**	**91.00**	......	......	......	......	......	22.20	27.12
Dallas	*l*	**71.00**	**71.00**	**61.00**	**59.00**	**61.00**	**66.00**	**80.00**	......	......	**72.00**	**80.00**	18.72	22.80
Denver		*101.00*	*101.00*	*111.00*	*109.00*	*109.00*	*110.00*	*107.00*	*130.00*	*129.00*	......	....	13.92	16.98
Detroit		**81.50**	**85.50**	**75.00**	**81.00**	**81.00**	**90.00**	......	......	......	......	......	21.78	26.58
		86.00	*86.00*	*85.00*	*85.00*	*85.00*	*85.00*	......	......	......	......	......	......	......
Kansas City	*b*	**110.00**	**110.00**	**100 103**	**100 103**	**105.00**	**105.00**	......	......	......	**105.00**	**105.00**	16.56	20.16
	b	*115.00*	*115.00*	*105 108*	*105 108*	*110.00*	*110.00*	*120/125*	*135.00*	*135.00*	.....	.....	......	......
Los Angeles	*a*	*94.00*	*94.00*	*88.00*	*88.00*	*88.00*	*88.00*	*98.00*	*105.00*	*95.00*	.....	.....	13.38*gh*	16.26*g*
Minneapolis	‡*b*	*111.00*	*111.00*	*111.00*	*111.00*	*111.00*	*113.00*	......	......	......	......	....	16.56	20.16
Montreal	*e*[6]	75.00	76.00	75.00	75.00	76.00	85.00	......	......	......	.....	.....	......	......
		155.00	*155.00*	*155.00*	*155.00*	*155.00*	*155.00*	......	*130.00*	......	......	.....	......	......
New Orleans	*l*	.....	.....	**70.00**	**75.00**	**75.00**	**70.00**	......	......	......	......	......	18.72	22.80
	l	*68.70*	*68.70*	*71.00*	*75.00*	*72.50*	*72.50*	*67.00*	*67.00*	*67.00*	......	......	......	......
New York	‡	**95/100**	**95/100**	**Range from $87.50 to $95.00**				**110/115**	......	......	**175/200†**	**175/200†**	22.86	27.90
	‡	......	......	*Range from $105.00 to $110.00*				*105/110*	*120/125*	*120/125*	......	......	......	......
Philadelphia				**Range from $95.00 to $104.50**				......	......	......	171.00	171.00	22.86	27.90
				Range from $110.00 to $120.00				*110/120*	*127.00*	*127.00*	......	......	......	......
Pittsburgh	*l*	**78.00**	**79.00**	**82.00**	**84.10**	**89.25**	**93.70**	**112.00**	......	......	.....	......	22.56	27.48
	l	*103.60*	*103.60*	*105.00*	*105.00*	*109.00*	*129.75*	*122.00*	*150.00*	*166.00*	......	......	.....	......
St. Louis	‡*j*	**95.00**	**98.50**	**87.50*m***	**92.50*m***	**99.50*m***	**107.00*m***	......	......	......	......	.....	18.72	22.80
	‡*j*	......	......	*115.00n*	*115.00n*	*115.00n*	*115.00n*	......	......	......	.....	......	......	......
San Francisco	*d*	*73.00*	*73.00*	*73.00*	*71.00*	*71.00*	*70.00*	*70.00*	*70.00*	*70.00*	.....	......	10.08*g*	12.30*g*
Seattle	*l*	*70.00i*	*70.00i*	*70.00i*	*70.00i*	*70.00i*	*70.00i*	*75.00i*	*75.00i*	*75.00i*	......	.....	......	.....

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [3] Spruce. [6] Western Pine No. 3 Common. ‡ Delivered. *a* Yard prices. *b* Retail prices, less than CL. *c* 5 M ft. or less. *d* Direct mill prices; f.o.b. purchasers carrier or truck. *e* Tax exempt. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* No. 1 common. *j* Delivered in 5000 ft. lots. *k* These are retail yard prices quoted per truck load in Greater Cleveland. Less 2% for cash. Truck lots. *l* F.o.b. mill. *m* 8 to 12 ft. lengths. *n* 8 to 16 ft. lengths.

Note: Special concrete form grade Fir Plywood, 4′ by 8′ panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on ⅝", $188.00; on ¾", $218.00. For other centers add rail freight increment from table on proper size. Oiling and edge sealing charges included.

† 18 ft. and under.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Jan. 16, 1946*a* Single or Double Thickness		EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50 lb. cases delivered in 200 lb. lots*
	A quality	B quality	
Atlanta	76%	76%	$0.2025
Baltimore	70–10%	71–10%	.2025
Birmingham	68%	68%	.1575
Boston	......	60%*i*	.2025
Chicago	64%	64%	.2025
Cincinnati	62–10%*e*	62–10%*e*	.2025
Cleveland	62-10–10–10%	62-10-10-10%	.2425
Dallas	65%	65%	.215
Denver	66%	66%	.2075
Detroit	62-10–10%	62-10–10%	.2025
Kansas City	65–10%*e*	65-10%*e*	.2075
Los Angeles	58%	63%*f*	.21
Minneapolis	64%	64%	.2075
Montreal	40–5%*bc*	40–10–5%*bc*	18.90*h*
New Orleans	68%	68%	.2125
New York	71%	72%	.32*g*
Philadelphia	69%	70%	.2025
Pittsburgh	70%	70%	.175
St. Louis	70–10%	70–10%	.2075
San Francisco	66%	73%	.2075
Seattle	54%	55%	.21

Price of 60% Ammonia Gelatin is $0.0125 per lb. higher than 40%

Glass; a Jobbers' list price per box, 14 x 20, ss, $20.75 for A quality, $18.00 for B quality; 14 x 20, ds, $30.75 for A quality, $26.00 for B quality. *b* Discount from list, Sept. 1939; sales tax included, but 6% tax exemption not allowable for. *c* Single thickness. *e* Discount from list of Aug. 15, 1938. *f* ss; ds—62%. *i* Double thickness 65%.

Explosives; * Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas. *g* In borough of Kings, Queens, and Richmond and in Manhattan south of Canal St., add delivery charge of $9.00 per trip. *h* F.o.b. city per 100 lb. forcite, 40%. Forcite 60%, $20.65.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.155	$0.1825	$0.2025
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.16 – .1675	.1875–.20	.2075–.22
Rocky Mtn. States	.16 – .1725	.1875–.20	.2075–.225
Pacific N. W. States	.1575–.17	.19 –.2025	.21 –.2225
Pacific S. W. States	.155 –.1625	.1875–.195	.2075–.2175

PILES, TIES F. O. B.

PILES

Prices per linear foot, fir and pine, bark on, f.o b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

			By Rail	
Dimensions	Points	Length	Pine*	Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.34	....
12-in.— 2-ft. from butt	6-in	50 to 59-ft.	.37	....
12-in.— 2-ft. from butt	6-in.	60 to 69-ft.	.39	....
12-in.— 2-ft. from butt	6-in.	90 to 100-ft.	....	.72
13-in.— 3-ft. from butt	5-in.	91 to 100-ft.	....	.73
14-in.— 2-ft. from butt	6-in.	50 to 69-ft.	.43	.80
14-in.— 2-ft. from butt	6-in.	70 to 79-ft.	.47	.74
14-in.— 2-ft. from butt	5-in.	80 to 85-ft.	.60	.75
14-in.— 2-ft. from butt	5-in.	85 to 89-ft.	...	.76
14-in.— 2-ft. from butt	5-in.	90 to 100-ft.	....	.80

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8′		7"x9"x8′6"	
		Untr.	Tr.	Untr.	Tr.
Boston	Oak *i*	....	.....	....	.....
	Pine *i*	....	....	....	.....
New York	S. L. Sap Pine	$1.65	$2.85	$2.00	$3.30
	Mixed Oak	1.80	3.05	2.50	3.60
Birmingham	Hardwood	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.55/2.60*a*	....	3.25/3.40*a*
Los Angeles	Douglas Fir	1.86	3.25*a*	....	......
Philadelphia	Red Oak	2.33	3.13	3.10	4.25*a*
St. Louis	White Oak	2.40	....	3.07	....
	Red Oak	2.29	2.95*a*	2.97	3.90*a*
	Sap Pine or Cypress	3.07*a*	....	....	....
San Francisco	Douglas Fir	1.60*e*	2.80*f*	2.10*bf*	3.88*caf*
Montreal	Birch or Maple	....*h*	....*h*	....*h*	....*h*

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 7" x 9" x 8′. *c* Empty cell. *e* Green. *f* F.o.b. cars. *h* No constant price available. *i* Not available

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder in drums f.o.b. works, per 100 lb.	$4.25
Chlorine cylinders, liquid, per lb. f.o.b. works	.07–.12
Calcium chloride, 77–80%, flaked, 100-lb. paper bag, f.o.b. works, ton	22.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb.	1.80
Soda ash, 58%, in paper bags, per 100 lb. dense	1.50
Sulphate of aluminum, commercial, in 100-lb. bags f.o.b. works	1.50
Sulphate of copper, in bags, per 100 lb f.o.b. works	8.10

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M. lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over,			BRICK Per M. in quantity		LIME Per ton, In paper, Carload lot,		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Hydrated finishing	Common hydrated	Pulverized, or lump
Atlanta	......	......	......	......	......	......	$25.00	$25.00	$19.00	$17.50	$17.50
Baltimore	$120.00	$126.00	$220.00	$240.00	$315.00	$340.00	32.00*k*	35.00*k*	30.18	18.00	.....
Birmingham	97.50	104.00	195.00	231.00	......	......	20.00*ff*	22.50*gg*	24.67	18.10	.....
Boston	145.65†	155.35†	291.30†	330.15†	......	......	32.00*i*	35.00*i*	30.80†	26.40†	.....
Chicago	115.00	122.50	230.00	......	......	......	21.00	23.00	27.00	19.50	.....
Cincinnati	170.00*j*	180.00*j*	240.00*jdd*	......	......	......	34.00*j*	34.00*j*	21.40*j*	21.70*j*	.....
Cleveland	118.00*cc*	126.00*cc*	236.00*cc*	......	......	......	28.50	28.50	24.00	22.00	27.50*ee*
Dallas	......	110.00	......	......	......	......	18.75	33.25	28.00	22.00	.....
Denver	......	......	......	......	......	......	30.00	30.00	34.80*bb*	28.00*bb*	34.00*bb*
Detroit	117.08	124.88	234.15	234.15	290.68	332.20	30.00*cc*	31.50*cc*	30.00	28.00	28.00
Kansas City	112.00	120.00	......	......	......	......	16.00*o*	18.50*o*	36.00*p*	30.00*p*	30.00*p*
Los Angeles	*r*	*r*	*r*	*r*	*r*	*r*	20.00§	.....	.....	36.00	35.00
Minneapolis	152.00*p*	176.00*p*	317.00*p*	176.00*wp*	......	......	30.00*rp*	.....	34.50*bbe*	25.50*bbe*	34.50*bbde*
Montreal	110.00*aq*	120.00*aq*	225.00*aq*	......	......	......	25.50	37.00	12.50*ub*	14.00*ub*	......
New Orleans	160.00	160.00	300.00	.....	......	.....	29.00	.....	38.00	26.00	37.50
New York	112.20*h*	119.60*h*	164.50*h*	179.40*hn*	......	......	33.00	.....	34.40	26.80	.....
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	27.00	30.00	29.75	17.50	24.50
Pittsburgh	98.50	105.80	181.85	217.30	265.85	303.60	26.00	38.00*y*	20.45	18.65	2.97*m*
St. Louis	119.00	130.00	235.00	235.00	320.00	......	32.50*sl*	30.50*sl*	.80*saap*	.60*saap*	1.00*aaspee*
San Francisco	132.00*a*	148.50*a*	198.00*dda*	148.50*ta*	......	......	30.00	.....	24.95	24.95	2.49*m*
Seattle	150.00*cc*	160.00*cc*	......	160.00*ccw*	......	......	32.00	39.00	32.00*shh*	32.00*shh*	3.60*mhh*

† F.o.b. *a* Smooth. *b* Per 50 lb. bags. *c* 6 x 12 x 12 in.-3 cell. *d* Pulverized hot. *e* 5% discount for cash. *g* 5½ x 8 x 12. *h* F.o.b. trucks, job site N.Y.C. *i* F.o.b. warehouse only. *j* Truck load or over. *k* $1.00 discount. *l* Red face. *m* Per bbl., 180 lb. *n* 7¾ x 7¾ x 12. Speed tile. *o* F.o.b. Buffalo. *p* Truck lots. *q* Provincial and Municipal tax extra. *r* Not used because of earthquate danger. *s* 2% discount for cash. *t* 5½ x 8 x 11½. *u* Tax exempt. *v* Sand lime. *w* 5 x 8 x 12. *y* Stacked. *z* Pebble lime price per 80 lb. sack. *aa* Price per sack. Lime not sold per ton. *bb* LCL. *cc* Truck delivery. *dd* 6 x 12 x 12. *ee* Pebble lime. *ff* 80% common. *gg* Select. *hh* LCL. § F.o.b. plant.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl.	WHITE LEAD Per 100 lb. in 100 lb. cases	READY-MIXED PAINT Per gal., drums			ROOFING SUPPLIES Carload lots f.o.b. factory				
	Dry *a*	In oil *w*	Graphite *b*	Aluminum *c*	Ferric Oxide *d*	Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 360 lb. bbl. per ton
Atlanta	$23.60	$31.375	$1.75	$2.70	$1.65	$2.06‡	$2.06‡	$2.06‡	$1.00‡	$36.00‡
Baltimore	23.35	31.00	2.25	3.50	2.75	2.75	3.30	3.30	.55	34.00
Birmingham	23.60	31.375	4.40	4.52	....	3.05	3.00	3.00	.48	42.00*ee*
Boston	23.35	31.00	....	...	....	....	....	2.75‡*q*	....	34.00
Chicago	23.35	31.00	....	....	....	2.82‡*u*	2.87‡*o*	2.87‡*o*	35.00‡*bbv*	38.00‡
Cincinnati	23.35	31.00	....	....	....	2.44‡	2.54‡	2.54‡	.35*y*‡	42.00‡
Cleveland	23.35	31.00	3.00	3.00*s*	3.00	2.44	2.54*o*	2.54*o*	.32*y*	38.00
Dallas	23.35	31.00	....	4.05	....	3.50*q*	3.75*q*	4.35*q*	.30	45.00
Denver	23.35	31.50	2.88	4.38	2.63	3.17*o*	3.10*o*	.....	.41*ff*	48.00
Detroit	23.35	31.00	3.24	2.72	3.60	2.32	2.41	2.41	....	35.00
Kansas City	23.35	31.125	...	....	...	3.65	3.80	....	.50	......
Los Angeles	23.60	31.50	2.80	4.00	3.50	2.32	1.77*e*	*l*	.65	*l*
Minneapolis	23.35	31.625*m*	....	....	....	2.42*idd*	2.47*hidd*	2.47*hidd*	.42*idd*	35.00*rdd*
Montreal	.....	23.65	3.25*p*	4.20*p*	3.62*p*	3.45*t*	3.15*tf*	2.65*tf*	...	2.60*kt*
New York	23.35	31.00	3.45*y*	....	3.45*y*	2.32	2.41*o*	2.41*o*	.34*s*	35.00
Philadelphia	23.35	31.00	3.25	3.65	3.15	2.54	2.94	2.94	.37	26.00
Pittsburgh	23.35	31.00	2.00	2.40	1.90	3.00	3.10*o*	3.10*o*	.37	40.00
St. Louis	23.35	31.00	....	....	....	2.48	2.54*h*	2.54*h*	.36	36.00
San Francisco	23.60	31.25	1.80	2.75*n*	1.35	2.27*x*	3.30*aa*	....	.38*g*	.....
Seattle	23.60	31.50	2.95*m*	2.95*m*	....	3.25*mqcc*	3.35*hmcc*	....	.49*mcc*	58.58*jmcc*

‡ Delivered. Note: Red lead in oil 50c higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266–31. *d* 80% minimum ferric oxide. *e* 15 lb. *f* Per 432 sq. ft. *g* 50 gal. drums. *h* Per roll. 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per cwt. *l* Not used. *m* 1% discount for cash. *n* May, 1941 price. *o* Per 60-lb. roll. *p* Tax included. *q* Per 90-lb. roll. *r* F.o.b. factory Chicago. *s* ASTM Spec. D266–41. *t* Federal tax included. *u* Per 90 lb. square. *v* Per ton. *w* Price to large paint contractors is $1.25 less. *x* Mineral surfaced. *y* 55-gallon container. *z* Drums. *aa* Approximate cost per 100 lbs. *bb* Roofers coating and cement. Price per ton. *cc* LCL, truck delivery. *dd* 2% cash discount. *ee* Asphalt, in 100 lb. package. *ff* 5-gal. drums.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Brick-layers	Car-penters	Struct. Iron Workers	Hoisting Engineers	Plas-terers	Electrical Workers	Steam-fitters	Common Labor	
								Building	Heavy Const.
Atlanta	$2.50	$1.775	$2.00	$2.00	$2.00	$2.00	$2.00	$0.85	$0.95
Baltimore	3.00	2.25	2.40	2.20/2.40	2.25	2.25	2.25	1.25	1.25
Birmingham	2.25	1.80	2.15	1.75/2.25	2.20	2.00	2.25	.95	1.05
Boston	2.50	2.10	2.40	2.45	2.50	2.30	2.30	1.55	1.55
Chicago	2.40	2.35	2.40	2.35	2.40	2.35	2.35	1.70	1.70
Cincinnati	2.50	2.20	2.35	2.50	2.375	2.375	2.35	1.46	1.46
Cleveland	2.375	2.325	2.375	2.25	2.375	2.375	2.375	1.725	1.725
Dallas	2.50	2.25	2.25	2.25	2.125	2.00	2.375	1.075	1.275
Denver	2.25*b*	2.10	2.00*b*	2.15*b*	2.25	2.25	2.24	1.40	1.35
Detroit	2.50	2.20	2.40	2.40	2.50	2.40	2.40	1.575	1.575
Kansas City	2.50	2.05	2.20	2.05/2.275	2.50	2.30	2.375	1.475	1.40
Los Angeles	2.625	2.0375	2.10	1.9875	2.25	2.40	2.50	1.4875	1.4875
Minneapolis	2.25	2.05	2.175	2.00	2.35	2.21	2.25	1.45	1.45
New Orleans	2.05	1.875	2.00	1.625/1.875	1.875	2.00	2.25	.90	.90
New York	3.20*b*	2.75*b*	3.00	3.00	3.20*a*	2.50*a*	2.75*b*	1.70	1.70
Philadelphia	2.75	2.25	2.65	2.50	2.50	2.375	2.50	1.25	1.25
Pittsburgh	3.00	2.50	2.50	2.65	2.625	2.375	2.50	1.50	1.50
St. Louis	2.75	2.45	2.425	2.55	2.50	2.50	2.50	1.50	1.75
San Francisco	2.8125	2.16	2.40	2.125	2.25	2.25	2.25	1.525	1.525
Seattle	2.365	2.065	2.265	2.20	2.365	2.265	2.50	1.665	1.70
Montreal*	1.40	1.25	1.30	1.20	1.40	1.35	1.11	.94	.88

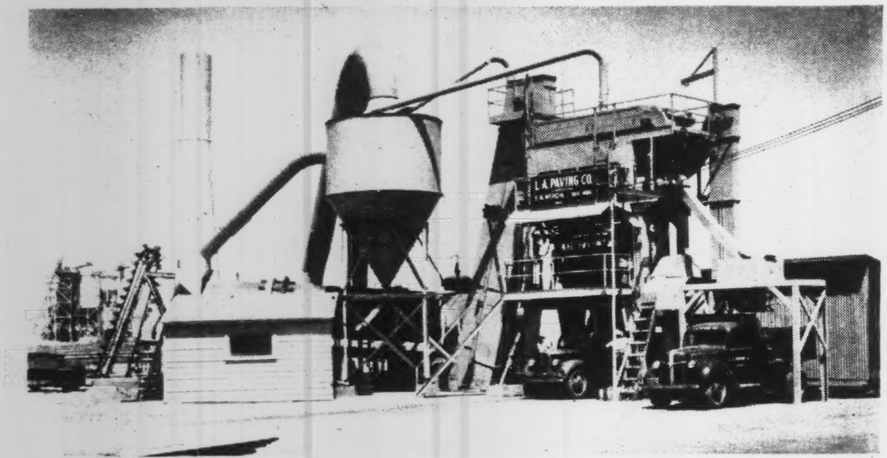
a 6 hr. day. *b* 7 hr. day. * Cost of living bonus now included in basic wage.

MEXICO CITY PRICES

In Pesos, F.o.b. City		Sept. '48	Oct. '48
Common Wages—Building (8 hr. day)	av. per hr.	.57	.57
Common Wages—Heavy Const. (8 hr. day)	av. per hr.	.75	.75
Skilled Labor Wages			
Carpenters (8 hr. day)	av. per hr.	1.25	1.25
Bricklayers (8 hr. day)	av. per hr.	1.25	1.25
Struct. Iron Workers (8 hr. day)	av. per hr.	1.50	1.50
Struct. Steel Shapes 3"–15" x 12 meters	per ton	1,300.00	1,300.00
Reinf. Steel, Corr. Rods			
3/8" x 12 meters	per ton	1,140.00	1,140.00
1/2" x 12 meters	per ton	1,080.00	1,080.00
5/8" x 12 meters	per ton	1,056.00	1,056.00
3/4" x 12 meters	per ton	1,020.00	1,020.00
7/8" x 12 meters	per ton	1,020.00	1,020.00
1" x 12 meters	per ton	1,020.00	1,020.00
Gravel truck load of 3½ cu. meters			
Blue Gravel	per tr. load	32.00	32.00
Rose Gravel	per tr. load	30.00	30.00
Cement, Std. Port. (Tolteca)	per ton	115.00	115.00
Lumber			
Mex. Sacred Fir (Oyamel)	per M ft.	350.00	350.00
1st Class Pine	per M ft.	700.00	650.00
2nd Class Pine	per M ft.	500.00	500.00

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) **$2.343. ENR Common Average: $1.413**

NEW PRODUCTS



Asphalt Paving Plant

Above is pictured a Madsen 4,000-lb. asphalt paving plant at Los Angeles, Calif., with a dust collector unit, consisting of a 12-ft. dia. cyclone and 80-4 exhauster. It has a pit type bunker with concrete underground tunnel and conveyor feed arrangement. The plant is practically dust-free.—*Madsen Iron Works, Inc., Huntington Park, Calif.*

Hot Water Generator

For hot water heating in large commercial and industrial type applications a hot water generator is available in two sizes, the larger being 875 gal. per hour at 100 deg. rise—completely automatic, oil or gas fired. Four-pass construction of shell insures high efficiency (more than 80 percent). There are sturdy industrial type safety controls. A refractory-lined rear door provides easy accessibility for maintenance. Generator shell, including the tubes, is galvanized. The outside is covered with a thick insulation jacket. Exhaust is vented easily to existing chimney. Size of large unit is 113x44x27 in.—*Cleaver-Brooks Co., 326 East Keefe Ave., Milwaukee 12, Wis.*

All-Wheel-Drive Trucks

This manufacturer announces a new line of heavy-duty, all-wheel-drive converted Ford trucks—the "Q" series. Three models are 4-wheel-drive; and three 6-wheel-drive, gross vehicle weight being 21,500 lb. and 35,000, respectively. Wheelbases range from 136½ to 220 in. The line of all-wheel-drive trucks includes 12 other Ford conversions and four heavy-duty Marmon-Herrington models.—*Marmon-Herrington Co., Inc., Indianapolis, Ind.*

Snow Plow Wax

An improved grade of snow plow wax suitable for spray as well as brush application, is announced. Applied to plow moldboards and wings, this wax creates a hard, slick surface off which snow slides easily. It prevents piling, helps to eliminate costly clearing delays and breakdowns from overloading. Wax can be sprayed on with an ordinary paint spray gun or applied with an ordinary paint brush while temperature is above freezing. The plow can be placed in service shortly after waxing. One gallon of sprayed wax covers approximately 300 sq. ft. of plow working surface. Available in 5-gal. pails and 15, 30 and 55-gal. drums.—*Pennsylvania Refining Co., 2686 Lisbon Road, Cleveland, Ohio.*

Glass Wall Tile

An all glass wall tile that comes in 15 different non-fade colors is ready. "Crys-Gas" is solid glass ⅛ in. thick. The hard, smooth surface is said to be impervious to stain, deterioration, mildew, peeling, warping, temperature changes, moisture, and dirt. This tile can be applied to wood, plaster, metal or cement.—*The Dearborn Glass Co., 2414 W. 21st St., Chicago, Ill.*

Road Grader Tires

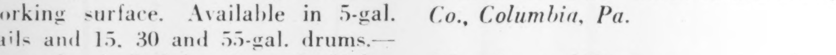
A new line of road grader tires with an extra heavy cord body and especially compounded tread and shoulder rubber has been announced. It is claimed that the heavy cord body will stand the hard usage given by contractors and road builders. Available in all sizes and plies from 900-24 through 1300-24 in the vacuum cup cleated type and in 700-24 through 900-24 in rib type.—*Pennsylvania Rubber Co., Jeannette, Pa.*

Dumping Bucket

An all-steel dumping bucket with a roller attachment which trips the bucket for dumping at any desired height, has been introduced recently. Attachment of the bucket and roller are performed in a few minutes. Primarily intended for use with the O.K. portable elevator, but can be obtained as a separate unit. The elevator carries materials up to a guaranteed height of 100 ft. at a maximum speed of 200 ft. per minute. Will carry loads ranging from 1,000 to 2,500 lb. The hoist units are of 10, 18 or 28 H.P.—*O.K. Clutch & Machinery Co., Columbia, Pa.*

Aluminum Window

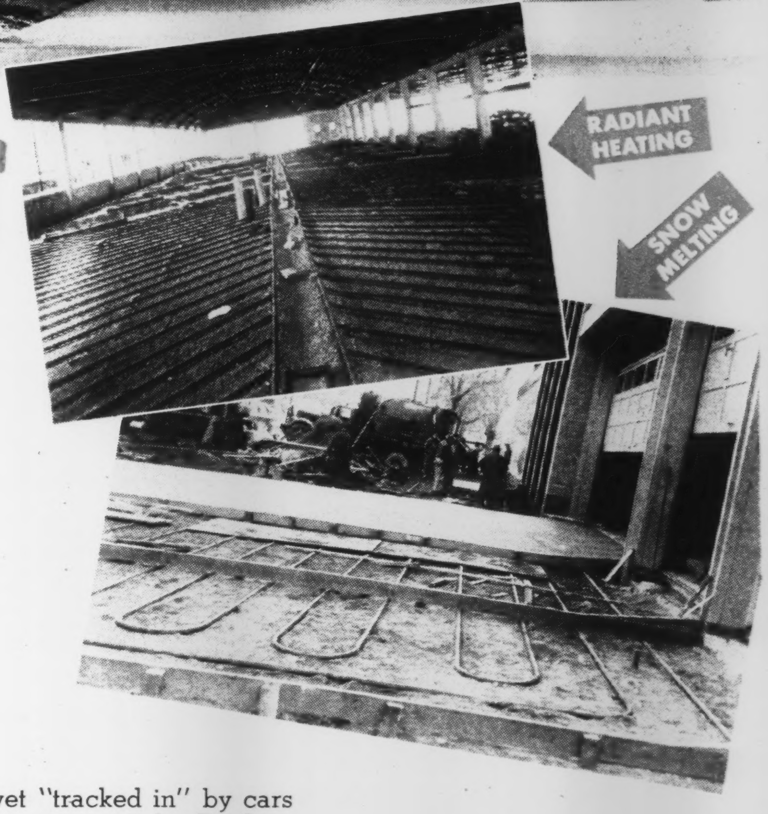
For an aluminum basement window, available in three-standard sizes, it is claimed that it eliminates repainting expense, never rusts and does not stick or bind even after years of use. A long aluminum locking handle permits easy opening and closing from floor level.—*Kewanee Mfg. Co., Kewanee, Ill.*



Vibratory Soil Compactor

This sled type vibratory compactor can be used as a self-propelling or tractor-drawn unit. Powered by 16-hp diesel engine total weight 3,100 pounds. Base plate area 10.4 square feet. In some soils this Vibro-Plus compactor, type MRJ-6, will obtain 95 per cent to a depth of 4 ft. in two passes. This percentage is the usual minimum required by most highway departments. When used as a self-propelling unit, it has a speed of from 20 to 35 fpm.—*Vibro-Plus Corp., 243 W. 55th St., N. Y.*

FORD
BENNETT'S
SERVICE



2 KNOCKOUT BLOWS

at winter with BYERS Wrought Iron Pipe

Two important modern developments were incorporated in Bennett Motor Company, automobile agency at Salt Lake City, Utah. The architects, Young and Hansen, utilized radiant heating to warm the structure, and a snow melting system to keep the driveway clear. Byers Wrought Iron pipe was used for both jobs, which were designed by Paul O. Huber and Rushby C. Midgley, engineers. A. H. Walsh Plumbing Company, the heating contractor, fabricated the coils.

INSTALLATION DETAILS

Grids were made from Byers $1\frac{1}{4}$-inch Wrought Iron pipe. The "herringbone" arrangement in the service-repair garage, clears pits and floor islands. Six individual grids were used to permit "zoning." Hot water supplied by a Pacific oil-fired boiler is circulated by Bell & Gossett pumps. Fulton Sylphon controls govern operation.

Sinuous coils were used in the snow melting system. Hot water is circulated through these coils as soon as snow or sleet appears, keeping driveway and sidewalk clear.

SOLVES DIFFICULT PROBLEM

Radiant heating has won wide acceptance for garage heating. It eliminates cold floors . . . and any snow or wet "tracked in" by cars is speedily evaporated. Further, the effect of drafts from frequently-opened doors is minimized. Snow melting is receiving an equally warm welcome because of its demonstrated effectiveness.

ENGINEERING APPROVAL

Wrought iron pipe offers an unusual combination of advantages for installations like these. It is easily formed and welded . . . it has high heat emission . . . it expands and contracts at equal rates with concrete and plaster . . . and it had proved its corrosion resistance in all types of applications.

WANT MORE INFORMATION?

You'll find full information in our bulletin, "Byers Wrought Iron for Radiant Heating". Ask for it. A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

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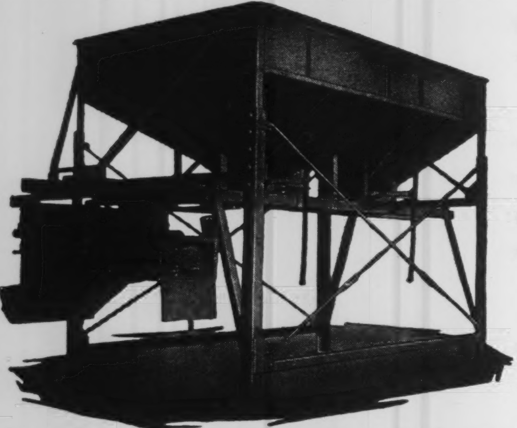
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS



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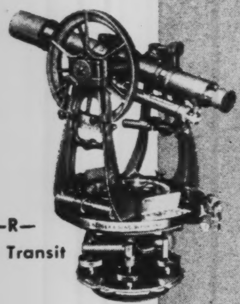

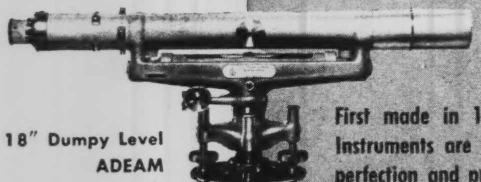

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18" Dumpy Level
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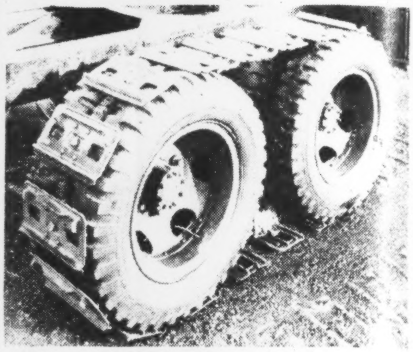
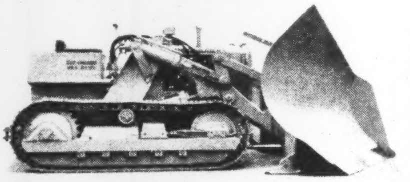


Truck Tracks

To beat snow and mud, truck operators may now fit their hauling equipment with crawler type tracks. Designed to add tractor performance to conventional single and tandem axle trucks, TRUCK TRACKS were tested and approved by U. S. Army Engineers. They permit effective hauling operations under mud, snow and desert conditions which stall ordinary wheeled vehicles. The tracks may be fitted to single or tandem axle trucks equipped with most standard dual tires. Mounting the tracks takes the driver about 10 minutes. Less time for removal. Pads are made of drop-forged steel alloy. Fitting is done by adding or removing pads and linkage. Every pad has a master adjustment to assure proper track tension. Connecting the pads is a cadmium-plated chain of heat-treated, high tensile steel.—*P & G Supply Co., 615 S. E. Market Street, Portland 14, Oreg.*



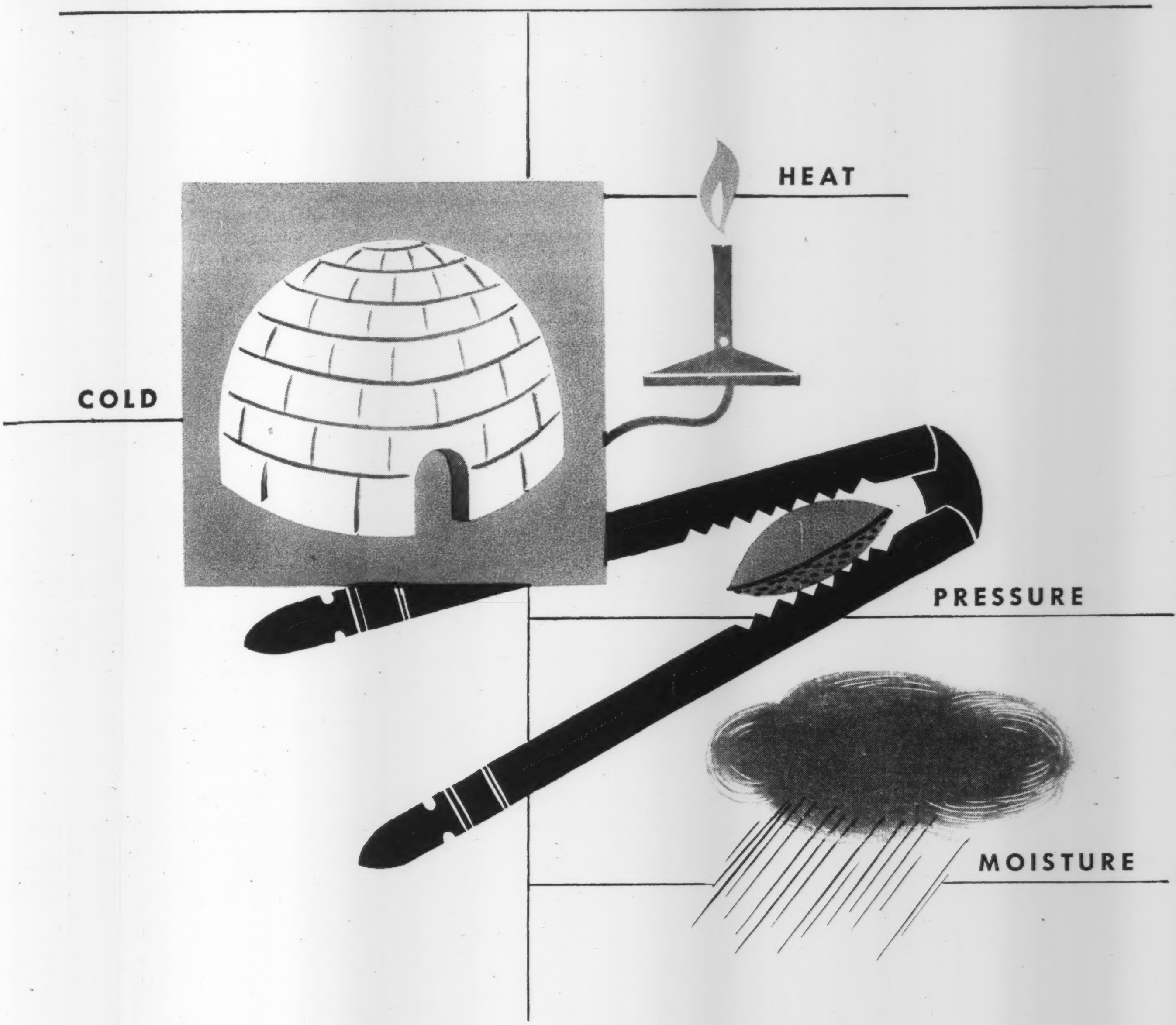
Snow Plow

V-type hydraulically-operated snow plow and a 2-cu. yd. snow bucket have been added to accessories for Allis-Chalmers HD-5 crawler tractor. Dimensions of plow are: width on ground, 116 in.; width at top, 128 in.; height of V in front is 44 in. and in rear 66 in. Snow bucket is 96 in. wide and has a 2 cu. yd. capacity. Both units are sold exclusively by Allis-Chalmers dealer organizations. Both plow and snow bucket are manufactured by Tractomotive Corp., Deerfield, Ill.—*Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis.*

Hauling Trailer

The flatbed, two-axle, front-loading model T-10 trailer is designed for hauling many types of construction equipment and materials. Features are low loading height, sturdy build, even weight distribution, generous-size

Stabilized to resist —


HEAT
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PRESSURE
MOISTURE

Think of the enormous pressure the gear teeth in a truck must withstand under severe operating conditions. Think of the gear lubricant . . . how necessary that it resist the tendency toward decomposition—loss of lubricating values—due to pressure and heat. *That's the outstanding virtue of Stabilized Quaker State Quadrolube*—its high lubricating values last longer. Every drop of base oil in Stabilized Quaker State Quadrolube is made solely from pure Pennsylvania grade crude oil. Stubbornly resistant to pressure, heat, cold, moisture, rust and corrosion, it can give more protection, last longer in *your* truck or bus transmission and differential systems. Try it.

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FOR SPANS UP TO 180 FEET
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DESIGN STANDARDS have been established for all sizes of Macomber Trusses. You can order by catalog number for the required load and span. We have absorbed this colossal engineering task through years of concentration in this field.

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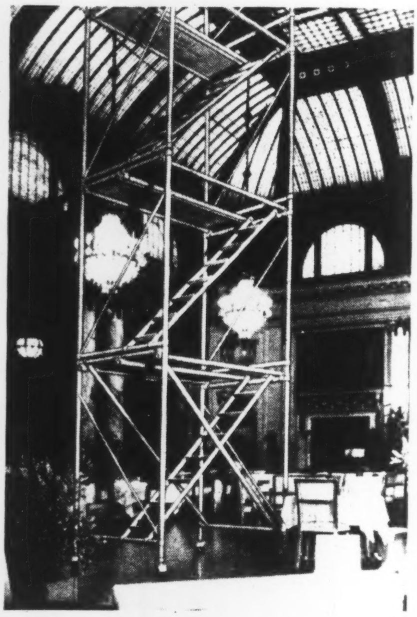
tires, and 4-wheel electric brakes. Two adjustable feet controlled by a built-in hydraulic jack permit easy removal of the front axle and tongue for loading and unloading.—*Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.*

Drawing Pencils

Now being imported again from the American Zone of Germany are the No. 2886 Mars-Lumograph drawing pencils, which have not been available since 1939.—*J. S. Staedtler, Inc., 53 Worth St., New York, N. Y.*



Lightweight Scaffold

Made of lightweight aluminum alloy, Up-Right Scaffolds are available in any number of section units. Lock-in feature eliminates all wing nuts, bolts, loose parts and requires no wrenches. Each section folds flat. A 4½x6-ft. foundation area is standard with optional outboard supports available to provide a 10x10-ft. foundation area. A safety-tread stairway permits user to mount the scaffold entirely within the structure.—*Up-Right Scaffolds, 1013 Pardee St., Berkeley, Calif.*

Pipe-Fitting Covers

Designed for use with the recently introduced Foamglas pipe insulation, new pipe-fitting covers are particularly suitable for use where exact temperature control is required, whether heat is to be retained or excluded. The pipe-fitting covers are being manufactured in all sizes for Ls, Ts, unions, valves, elbows and flange covers. Being of true glass composition, they retain their original insulating efficiency permanently. Foamglas is not affected by humidity, is

Paving Engineers can take a tip on TEMPERATURE EXTREMES *from the* DESERT NOMAD...

A hundred degree drop in four hours! Yet the desert nomad is comfortable without a change of clothes. His burnoose (that long, cape-like headdress) protects him under the burning heat of desert noon and the chill winds of desert night.

One dress for *two* extremes.

Do the same for concrete pavement. Choose *one* joint-sealing compound that protects at *both* extremes. Choose *Flintseal.**

You get all-'round, all-weather protection with this modern, rubber-bearing thermoplastic. Joint sealing that cuts maintenance costs to the bone because Flintseal lasts and lasts. Surety for a really big investment of public funds.

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A view of a trailer-mounted heating device and special pouring pots on large concrete-paved airport.

1. Seals joints effectively against infiltration of moisture and other foreign matter.

2. Adheres firmly to concrete . . . without use of primers . . . extensible and compressible through repeated cycles of expansion and contraction of concrete slabs.

3. Maintains resilience . . . does not become brittle and crack in coldest weather, nor will it flow in hottest weather.

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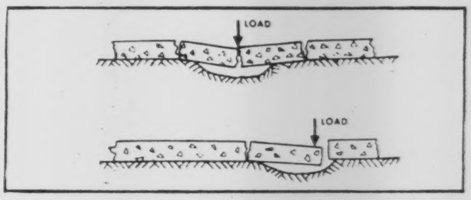

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35 LOADS HAULED PER HOUR

★ The above picture of a small Sauerman Scraper digging gravel from pit and delivering to crushing plant shows the simple effectiveness of this method. This Sauerman machine uses 4½ gals. of gasoline to move 45 cu. yd. of material per hour.

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POWER SCRAPERS and CABLEWAYS

SAVINGS in equipment cost, time and labor are your direct gains on dig-and-haul jobs with a Sauerman Scraper or Cableway.

ONE-MAN CONTROL, fast and positive action. Reaches across a river, pond, pit or stockpile, or to top of hill—moves material from any point within cable radius, and dumps automatically wherever desired.

Whether you handle a few tons a day, or many thousand tons, we can supply size and type of equipment that will meet your exact requirements economically. It will be built to give you years of service and require little by way of repairs.

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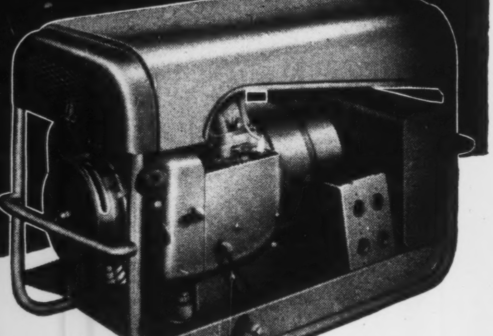
SAUERMAN
Long Range Material Handling Machines

New LIGHTWEIGHT ELECTRIC PLANT

5000 WATTS D.C.



Model 5CK-115M, 5,000 watts, 115 volts D.C.

Weighs only 315 lbs.!

Use fast-working electrical tools on any construction or maintenance job with this high capacity, portable, compact electric plant. Equipped with four-receptacle box for direct plug-in of tools or lights. Available with carrying frame, or dolly-mounted. Powered by Onan 10 HP, two-cylinder, 4-cycle, air-cooled engine. Shipped complete . . . ready to go!

NEW ONAN "CK" ELECTRIC PLANTS are available in 5000 watts D.C., 115 and 230 volts; 2000 and 3000 watts A.C. in all standard voltages.
COMPLETE ELECTRIC PLANT LINE INCLUDES: A.C.—350 to 35,000 watts in all standard voltages and frequencies. D.C.—600 to 15,000 watts, 115 and 230 volts. Battery Chargers—500 to 6,000 watts, 6, 12, 24, 32 and 115 volts.
ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 HP. BH: 2-cylinder opposed, 5½ HP. 1B: 1-cylinder, 3¼ HP.

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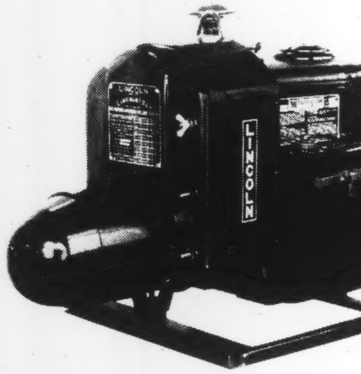
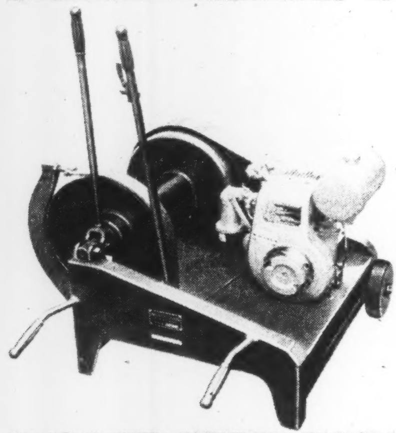
ONAN ELECTRIC PLANTS

waterproof, vaporproof, fire retardant and highly resistant to fumes, acids, and many other elements which cause other materials to lose insulating values.—*Pittsburgh Corning Corp., 632 Duquesne Way, Pittsburgh, Pa.*



Portable Welder

An inexpensive, complete, lightweight portable welder is roughly 2 ft. wide, 2 ft. high and 4 ft. long. With a current range from 20 to 180 amp., the machine provides three ranges of output current on the output panel, generator controls in an enclosed cabinet above the generator (cooled through a fan mounted on the generator shaft) and mounting rails. The welder is powered by a 2-cylinder air cooled engine. Engine speed (1800-2300 rpm.) determines welding current. Net weight is 502 lb.—*Lincoln Electric Co., Cleveland 1, Ohio.*



Roofer's Hoist

Model 500 develops 500-lb. single line pull at 200 ft. per min, as standard rating. Optional ratings from 650 lb. at 150 ft., to 200 lb. at 500 ft. available on order. Hoist is powered by 4.2-hp. single cylinder air-cooled gasoline engine. Weighing 410 lb., equipped with pressed steel wheels and wheelbarrow type handles, hoist is easily moved by one man.—*American Hoist & Derrick Co., St. Paul 1, Minn.*

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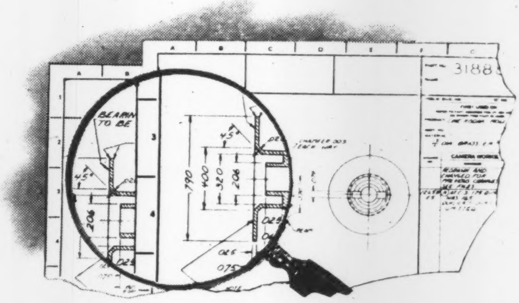

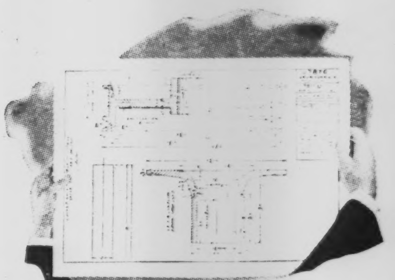

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Designed for modern drawing reproduction . . . Kodagraph Autopositive Paper prints direct-to-positive in ordinary room light. Exposure is on familiar blueprint or direct process equipment, or in a vacuum frame. Processing is simple—photographic—without darkroom—without any time-consuming, detail-losing negative step. Finished Kodagraph Autopositive Paper intermediates are tough, long-lasting. They permit deletions—take drawing board changes readily—help reduce redrafting time and expense.

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Industrial Photographic Division
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One reliable source for Everything Electrical ... to distribute, control and utilize electric power

Badly needed expansion of both government and private hospitals is now bringing construction programs to an all-time peak.

For this type of construction, as well as all other commercial and industrial buildings, Westinghouse offers architects and contractors a unique advantage. *Everything electrical*—from distribution and control apparatus to highly specialized x-ray and lighting equipment—can be obtained through one reliable source.

By centralizing responsibility with Westinghouse for power distribution equipment, construction and building equipment, heating and ventilating equipment and lighting units, you gain important advantages:

1. **SPECIALIZED ENGINEERING** ... to assist in selecting and applying equipment for maximum efficiency.
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Call your nearest Westinghouse District Office or Distributor for full information on this co-ordinated service. When there's CONSTRUCTION AHEAD requiring electrical equipment of any kind . . . you can be *sure* if it's Westinghouse.

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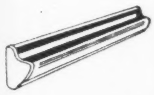
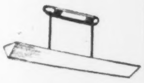
LAMPS AND LIGHTING EQUIPMENT

Lighting Equipment



Sterilamps



luorescent Luminaires

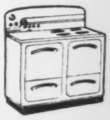
Sun Lamps

Heat Lamps

Light Bulbs

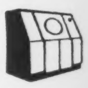
CLINICAL AND SERVICE EQUIPMENT

X-Ray Equipment



Electric Ranges

Refrigerators



Laundry Equipment

Water Heaters

Water Coolers

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Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

CONSTRUCTION AHEAD

S. M. DIXON USES
TO CUT COSTS ON ARKANSA

"A TOURNACRANE ON THIS JOB HAS CUT OUR COSTS CONSIDERABLY"—Assert R. W. Colby, Supt. for S. M. Dixon on McCrory, Ark., job, who used rig handle loading, unloading of materials, steel erection, concrete placemen other utility lift and carry work.

S. M. Dixon Construction Co. of Warren, Ark., is using a 7-ton *TOURNACRANE* to speed completion of three beam bridges, part of State Highway 17 being built between McCrory and Tupelo. New route passes through low, swampy terrain, crosses several channels Cache River, requiring bridges 100, 400 an 800 feet in length. All three employ sam design — a series of four-pile piers, with fiv 34′ x 2′ x 8″ steel girders per span. Versati *TOURNACRANE* handles all girder erectio . . . carries them from stock pile or semi-traile through mud holes and ruts, and accuratel spots them on pier caps.

Operator Delton Roe says, can operate this rig all da long and never be tired." He he maneuvers the *TOURN CRANE* up side of abutment put girder in place.

DISTRIBUTORS: Certain exclusive territories are currently available for marketing *TOURNACRANES* and several other types of LeTourneau equipment not in the earth-moving field. All applications will be carefully considered.

OURNACRANE
A RIDGE JOB . . .

IMINATES NEED FOR SECOND CRANE—

hen unseasonal rain forced storage of steel half-mile from b, Dixon had to haul it in when needed with assistance of nd-by tractor. But rugged, fast-moving *TOURNACRANE* t costly man hours and eliminated need for second crane . . . traveled the half-mile to load trailer, returned half-mile to load it and then handled actual steel erection, all despite ud holes and spongy ground caused by high water table . . . *ly foot-and-a-half from surface!*

rsatile as a handy-man, the 7-ton rig easily handled the job's neral utility work . . . placed reinforcing steel in cap forms . handled concrete bucket for placement of pier caps . . . and otted miscellaneous structural members, expansion shoes, etc., ith speed and accuracy.

OVES JOB-TO-JOB OVER HIGHWAY—

OURNACRANE'S big, low pressure tires work or travel over vement without surface damage . . . permitted Dixon to drive s crane 193 miles from Warren bridge job in 13 hours . . . iminated shipping delays . . . saved freight bills.

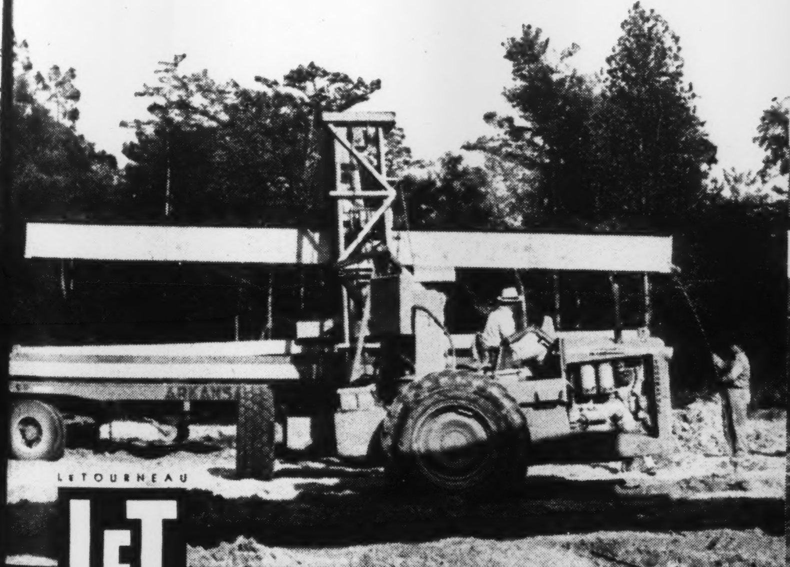
ere's a unit that will save you plenty . . . and it's only one of complete line designed to handle the toughest lift and carry bs. So, write without obligation for LeTourneau engineers' lution to your specific lift and carry problems. Remember, *ere's a TOURNACRANE to fit your job!*

ABOVE: *TOURNACRANE* places concrete for pier cap with ½ yard bucket, weighing 3,100 lbs. Rig's design permits big pay load at long reach.

BELOW: Despite spongy, muddy terrain, *TOURNACRANE* maneuvers, spots girder swiftly, accurately.

BELOW LEFT: 7-ton utility rig handles all lift and carry work on Dixon's job. Here it quickly unloads incoming steel girders.

BELOW: Backing into position, *TOURNACRANE* readies its load for placement. Positive electric controls and power steer make this maneuvering easy.



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EQUIPMENT

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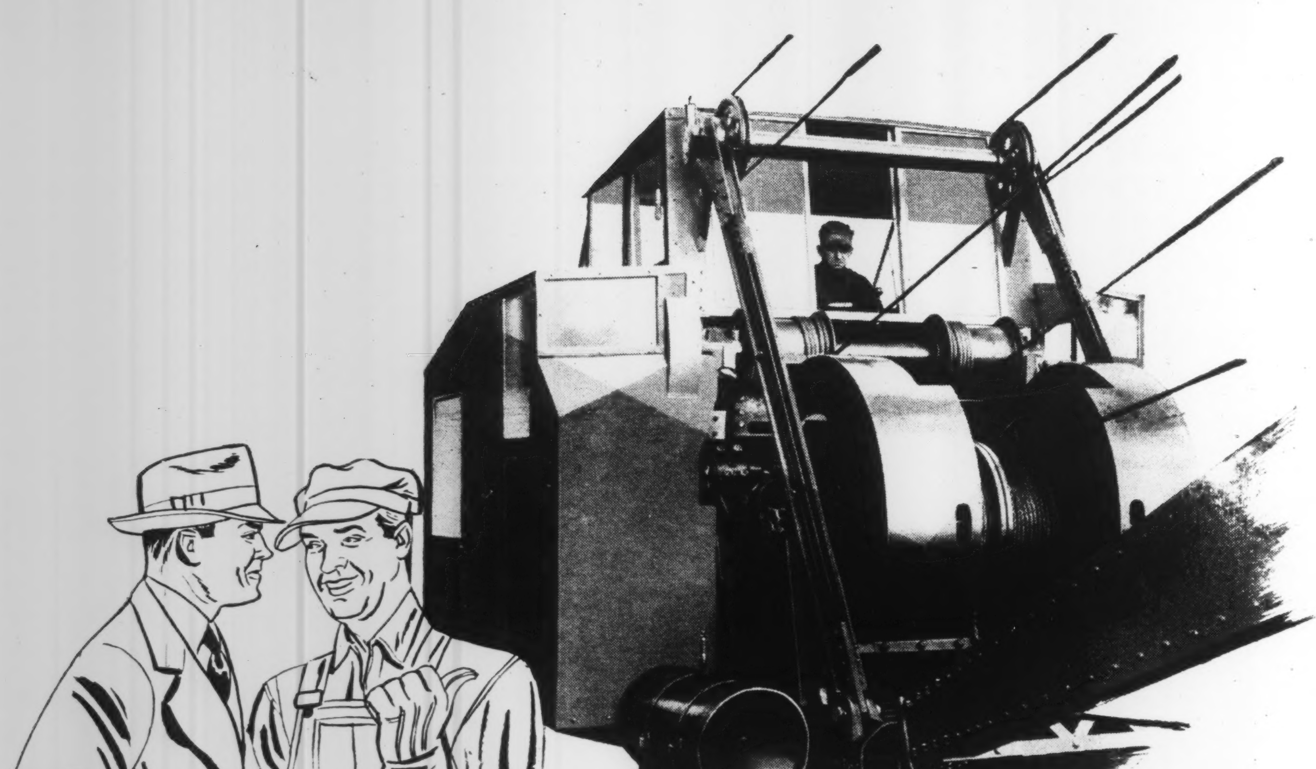


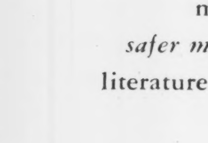
"YOU CAN TELL BY THE CAB IT'S AN *Industrial Brownhoist*"

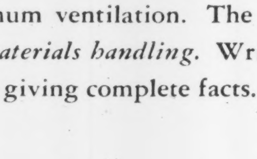
Men who know cranes can always spot an Industrial Brownhoist by its exclusive, patented Monitor-type cab. The operator is centrally located in relation to the load and is stationed above and behind the machinery. It provides the operator with 360° visibility—*front, rear and both sides*—plus a full view of hoist and boom drums, machinery and load at all times. Two doors, one on each side of the cab, *contribute to greater safety* and with the windows afford maximum ventilation. The result is *easier, faster, safer materials handling.* Write today for illustrated literature giving complete facts.

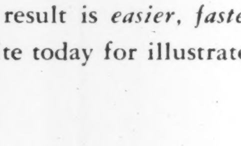
BROWNHOIST BUILDS BETTER CRANES

ROPE-REEVE CLAMSHELL BUCKET

LINK-TYPE ORE GRAB BUCKET


POWER-WHEEL CLAMSHELL BUCKET


250 TON WRECKING CRANE


COAL—ORE BRIDGE

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICH. • **DISTRICT OFFICES:** NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO • **AGENCIES:** DETROIT, BIRMINGHAM, HOUSTON, LOS ANGELES, PORTLAND, SAN FRANCISCO, SEATTLE, SPOKANE, CANADIAN BROWNHOIST LTD., MONTREAL, QUEBEC.

Insulated Steel Frame Building

"Packaged" building provides insulation as an integral part of structure by combining steel framing with Celotex Cemesto structural insulation panels claimed to be equal in insulation value to a common brick wall 18-in. thick. Wide variety of sizes and combinations of windows and doors is available. Steel framing and Cemesto panels are accurately cut to size and all parts are numbered to make job of assembly simple and quick. Framework is of alloy-steel angles and channels. Panels comprise insulation board core to which cement-asbestos board has been laminated on both sides. A moisture-proof vapor-resistant bituminous adhesive bonds all layers to form an integral unit. Steel-Bilt buildings are permanent structures but can be dismantled and moved to a new location and reassembled.—*Steel-Bilt Construction Co., Inc., Bridgeville, Pa.*

Motor Grader

A powerful new AD-4 motor grader for heavy duty construction and maintenance work is announced. Matching the rugged structure of this 22,140 lb. grader is a 104 brake h.p. General Motors diesel engine. The twisting strains and shocks imposed on graders are more easily absorbed by cylindrical sections through a flexing action. The tubular frame gives the unit a rigid backbone and permits enclosed controls. A complete blade range for any job is achieved by hydraulically controlled front mounted lift cases which provide direct down pressure and allow cuts measured to a fraction of an inch.—*Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

Snow Removal Device

New device for Roto-ette, a single-wheel power unit, scoops snow from sidewalks and driveways and blows it out of the way. Particularly suited to needs of factories and institutions with long driveway and sidewalk areas. Consists of a reverse wedge-shaped scoop equipped on left hand side with snow chopper screw conveyor which carries snow to a fan which blows the snow to

Insurance . . . and YOU

#12 of a series of informative articles on insurance and bonding.

Have you enough Business Interruption Insurance to protect next year's profits?

You probably carry Business Interruption Insurance to provide the profits which you would otherwise lose during a shutdown due to fire, windstorm, riot or other insurable hazard. Many farsighted managements have long protected their earnings this way.

If disaster should force a shutdown of *your* operations, would your Business Interruption Insurance be sufficient to pay continuing costs . . . and leave enough to cover your normal net profit, too?

Actual losses show that many companies do not have *enough* Business Interruption Insurance to cover their potential losses. That's because they've neglected to keep their policies in line with anticipated earnings.

Now, while planning for the new year, is a good time to figure exactly how much a shutdown might cost you and how much insurance you need to close this loss gap. The Hartford's work sheets make this calculation easy. Write us for them or call your Hartford agent or your broker.

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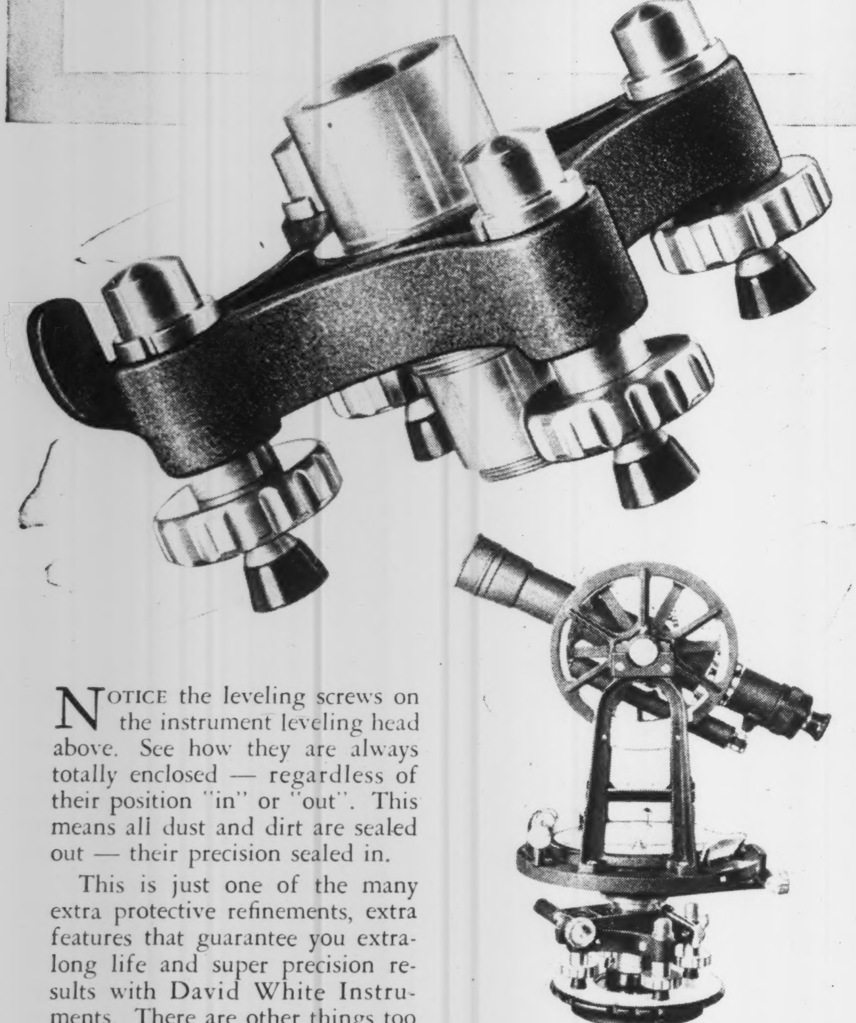

NOTICE the leveling screws on the instrument leveling head above. See how they are always totally enclosed — regardless of their position "in" or "out". This means all dust and dirt are sealed out — their precision sealed in.

This is just one of the many extra protective refinements, extra features that guarantee you extra-long life and super precision results with David White Instruments. There are other things too — the waterproof compass box, the overall weatherproof morocco finish—coated optics—hand-fitted, anti-friction, virgin hard, bell metal centers—plus the David White improved engraved plate levels with counter adjusting springs.

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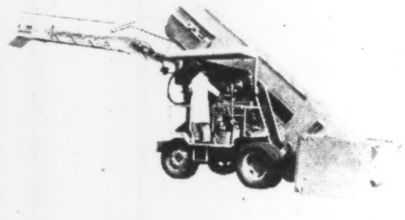
right or left as desired through spouts to a distance of from 15 to 20 ft. clear of the sidewalk or drive. Snow blower clears path 3 ft. wide. Device is guided by handle bars with motor controls located on the handles. Unit is powered by air-cooled motor through a two-speed transmission with multiple-cone clutch running in oil. Blower can be removed and replaced with a blade snow plow.—*Rototiller, Inc., 100 Second St. and Ninth Ave., Troy, N. Y.*



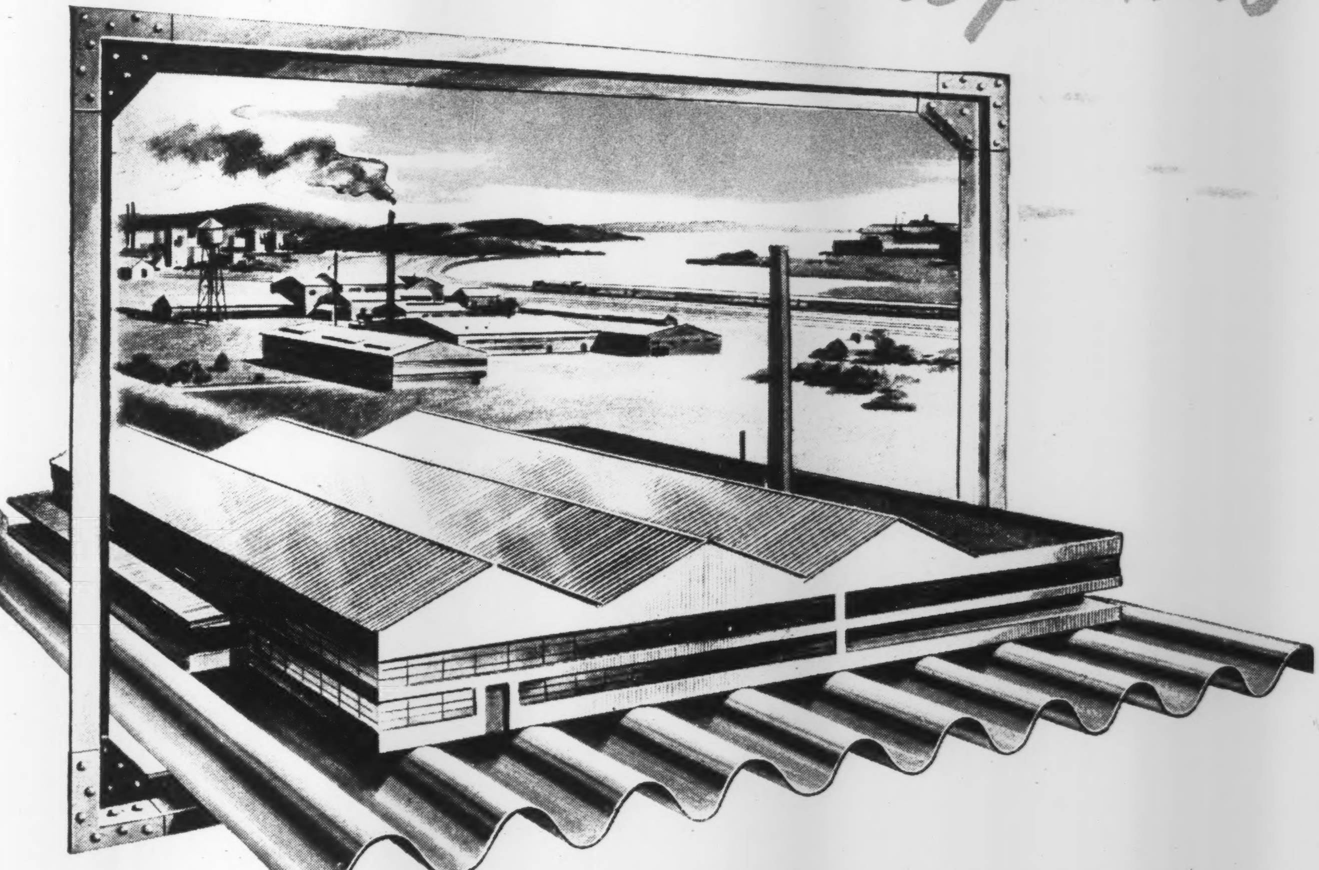
Snow Loader

A swivel belt conveyor designed to speed snow removal regardless of traffic conditions is the outstanding feature of Haiss Snow Loader, Model 300 WS-SBC. Swinging through an arc of 22 ft., the swivel conveyor permits snow to be discharged to trucks on either side. It extends over the highest truck cabs; therefore trucks driving either forward or backward under the conveyor extension can be loaded quickly to full capacity. The loader itself is designed for easy maneuverability so that it can clean up close to parked cars, discharging snow to a truck at either side or rear. There are heavy feeding propellers which chop and lift as they dig dry or hard-frozen snow. The machine has a capacity of 15 to 20 yd. per minute and can clean 15 to 20 city blocks in a six-hour shift, doing the work of 80 men removing snow by hand shoveling.—*George Haiss Mfg. Co., Inc., division of Pettibone Mulliken Corp., 141st to 144th St. on Park Ave., New York 51, N. Y.*

Tilting Arbor Saw

Constructed of cast iron precision-ground, table measures 18x25-in. and has removable insert. Saw with 8-in. blade tilts to full 45-deg. and gives maximum $2\frac{5}{8}$-in. cut. Miter gage with 24-in. extension arm and a special motor mount are included. Saw blade is 7-in. from front of table. The $\frac{5}{8}$-in. diameter spindle has sealed-for-life ball bearings. New and improved rip fence is adaptable to either right or left hand. Recommended speed is 3,000 rpm. Shipping weight is 20 lb. Angle or tilt and depth of cut are positively controlled by easy acting hand-wheels.—*Foster Mfg. Co. 1 Kinsey Ave., Buffalo 17, N. Y.*

You save on the frame *and on the whole picture*



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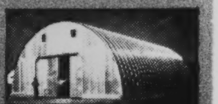

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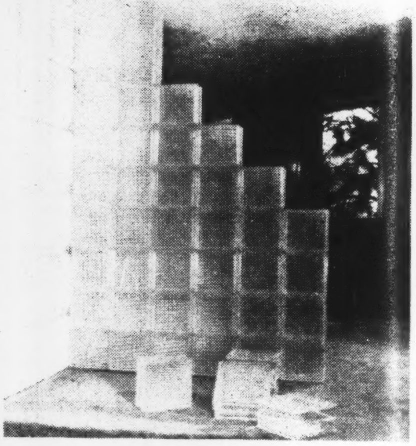

Interior Partition Block

Soon to be ready is an interlocking plastic partition block for interior non-load-bearing use. Made of Styron, the blocks are about $7\frac{3}{4}$ in. square and 4 in. deep. Weighing about one-fifth as much as glass blocks, they have a smooth outer surface, while the inner surfaces are composed of hundreds of diamond-like facets which produce a beautiful effect as the light passes through them. An interlocking rib allows quick installation.—*Columbia Protektosite Co., Inc., Carlstadt, N. J.*

Roof Decking

New lightweight Durisol single unit roof plank is made of steel-reinforced mineralized wood shavings combined with Portland cement and molded under pressure. Planks 16 in. wide and up to 8 ft. long support live load of 40 lb. per sq.ft. and require no sub-purlins, thus resulting in a claimed saving of nearly 20 percent in structural steel. Made in thicknesses of $3\frac{1}{4}$ and $4\frac{1}{4}$ in. Top side of plank is coated with $\frac{1}{4}$ in. cement surface at factory and planks are tongue-and-grooved on long sides. In installing slab, galvanized metal clips are wedged to steel flange of supporting member and nailed to plank. The roof plank weighs about 14 lb. per sq.ft.—*Durisol, Inc., 420 Lexington Ave., New York, N. Y.*

Side-Dump Wagon

New side-dump Euclid for off-the-highway earth or rock haulage has pay load capacity of 40,000 lb. and a struck measure capacity of 13 cu.yd. Downfolding side gates open automatically by mechanical linkage when body is raised by hydraulic twin hoists. Either right or left side dumping is possible. Euclid tractor is powered by 200-h.p. diesel engine and provides top speed loaded of 33.4 m.p.h. Tires on drive and trailer wheels are 24x25 for good traction and flotation on soft fills. Equipment can dump load non-stop.—*Euclid Road Machinery Co., Cleveland 17, Ohio.*

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What's more, we furnish an operator for an initial period of time until your own operator learns how to operate and maintain the dredge.

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Manufacturers' Publications

Horizontal Moto-Mixers—A bulletin explains features of a moto-mixer—such as chain drum drive, 3 point drum mounting, leakproof charging door, and the discharge spout. The bulletin also covers agitators.—*Chain Belt Co., 1600 West Bruce St., Milwaukee 4, Wis.*

Hoists—Circular covers new Clyde Frame 4 hoists—gasoline, electric and diesel with one, two or three drums. The one-drum can be expanded easily to two or three drums by adding drum extensions as needed.—*Clyde Iron Works, Inc., Duluth 1, Minn.*

Portable Material Elevators—An elevator with a new allowable height of 97 ft. and a platform lift of 90 ft. is announced in an 8-page catalog. The elevator is self-erecting when used at a height of 47 ft. or less. A concrete bucket of 14 cu.ft. capacity is interchangeable with the 6x6 ft. platform.—*American Hoist & Derrick Co., 63 South Robert Street, St. Paul 1, Minn.*

Servicing Diesel Engines—Three new bulletins describe the design, performance and facilities for servicing diesel engines. One is a non-technical description of the system of fuel delivery and injection; another describes the application to trucks, shovels, earth movers and other equipment; and the third is a large wall map showing the location of sales service and parts facilities.—*Cummins Engine Co., Inc., Columbus, Ind.*

Price Computation—A 64-page book is a time and labor saver for those in the steel industry who buy from Canadian warehouses or rolling mills in the territory from the Atlantic coast to Kingston, Ont. Tabulated information makes price computation possible in two simple operations.—*Dominion Bridge Co. Ltd., Toronto and Ottawa, Ont., and Montreal, Que.*

Gravel Plant—A 12-page booklet explains the principle of bottom deck feed as applied to duplex crushing and screening plants for gravel.—*Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.*

Portable Power Tools—A new catalog describes the full line of Syntron power tools, including portable electric hammers, gasoline hammer paving breakers, external concrete form vibrat-

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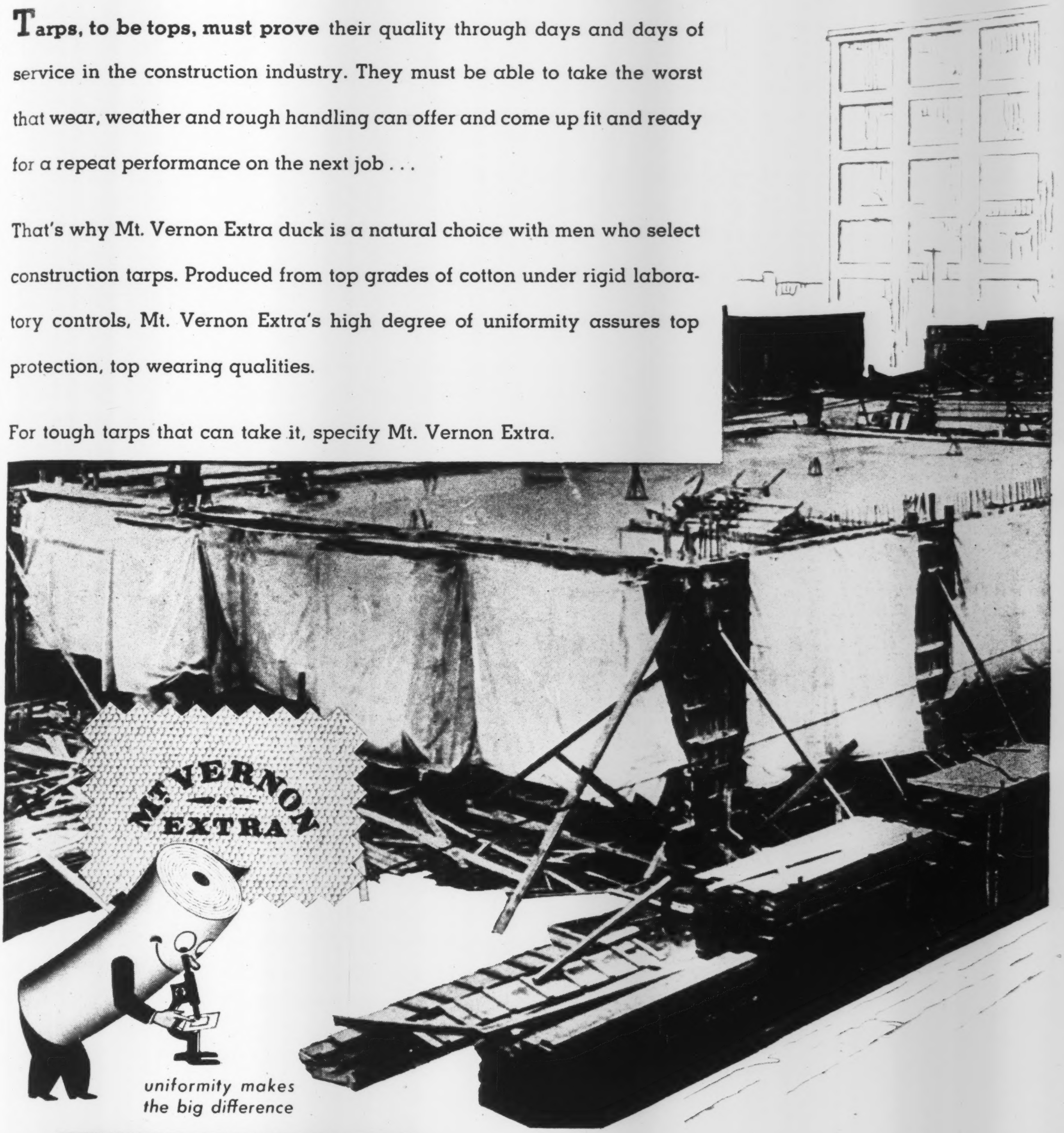
That's why Mt. Vernon Extra duck is a natural choice with men who select construction tarps. Produced from top grades of cotton under rigid laboratory controls, Mt. Vernon Extra's high degree of uniformity assures top protection, top wearing qualities.

For tough tarps that can take it, specify Mt. Vernon Extra.



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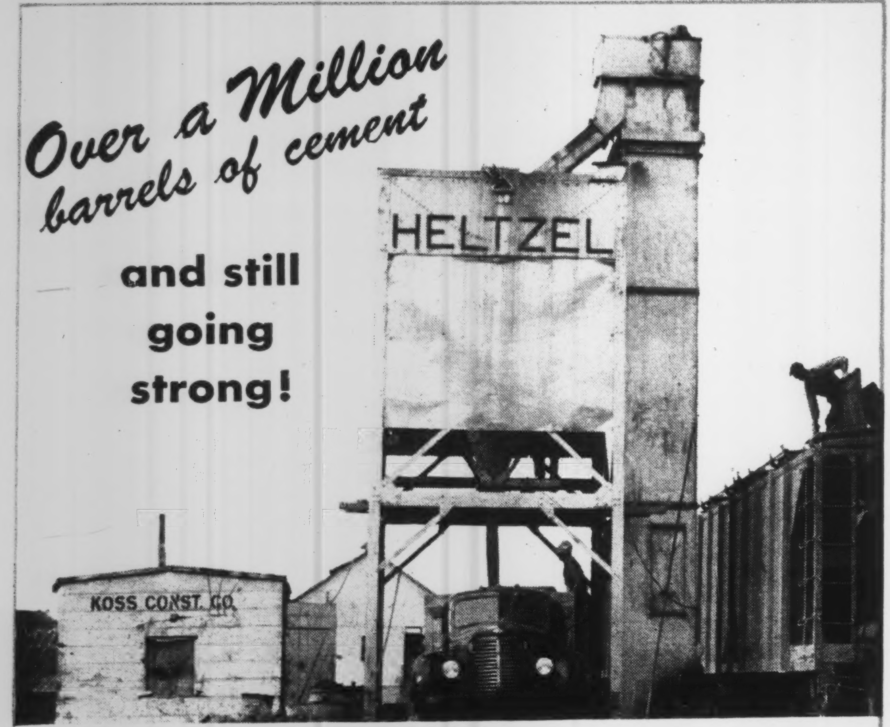


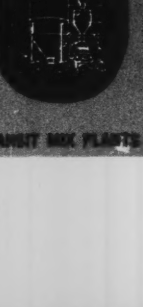
VETERAN HELTZEL PLANT HAS REPAID ITS COST 42 TIMES OVER IN 17 YEARS . . .

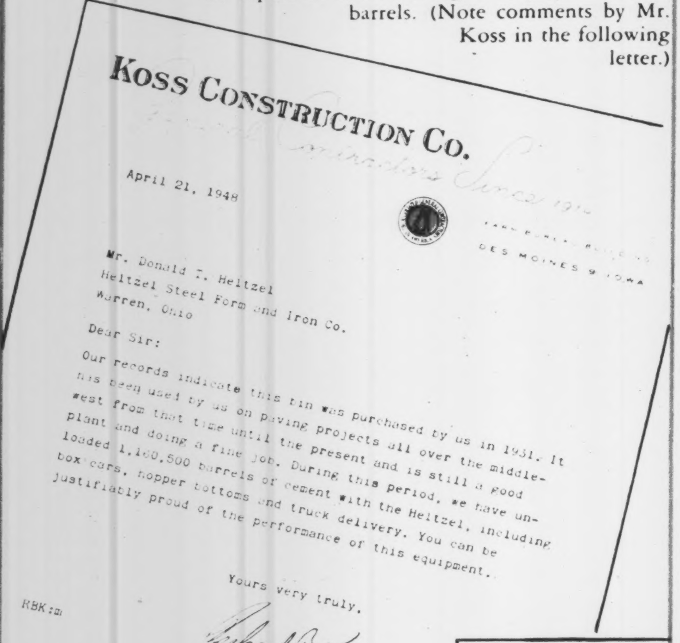
• 1,160,500 barrels of cement have been unloaded by this plant. In 1931, time studies indicated the plant cost would be repaid at the handling of 25,000 to 30,000 barrels. (Note comments by Mr. Koss in the following letter.)

PORTABLE AGGREGATE BINS

CONCRETE PRODUCTS AND CENTRAL MIX PLANTS

BULK CEMENT PLANTS


TRANSIT MIX PLANTS


KOSS CONSTRUCTION CO.

FARM BUREAU BUILDING
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April 21, 1948

Mr. Donald T. Heltzel
Heltzel Steel Form and Iron Co.
Warren, Ohio

Dear Sir:

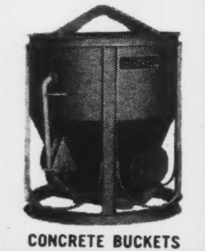
Our records indicate this bin was purchased by us in 1931. It has been used by us on paving projects all over the middle-west from that time until the present and is still a good plant and doing a fine job. During this period, we have unloaded 1,160,500 barrels of cement with the Heltzel, including box cars, hopper bottoms and truck delivery. You can be justifiably proud of the performance of this equipment.

Yours very truly,

Richard B. Koss
Richard B. Koss
Vice President

RBK:m

Heltzel plants are products of specialized engineering, and constructed for lasting, trouble-free service. Your requirements for plants will be served best by Heltzel. Write for information and literature.


CONCRETE BUCKETS

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ors, internal flexible shaft concrete vibrators, and portable electric drills, grinders, sanders and accessories.—*Syntron Co., Homer City, Pa.*

Industrial Water Treatment—A booklet describing industrial water treatment problems and modern methods of solving them is now available. The booklet, of particular interest to plant engineers and managers and executives is printed in two colors and illustrated with photographs and charts. The text covers industrial water treatment from simple, basic theory for the layman to specific problems involved in the use of water for power, process and cooling.—*The Bird-Archer Co., 400 Madison Ave., New York 17, N. Y.*

Power Roof Ventilator—An automatic power roof ventilator is described in a circular. In Verti-Stocks the butterfly dampers open wide the instant the fan is started and the air is exhausted straight upward, blowing foul air, smoke, fumes or dust high above the roof.—*Oliver & McClellan, 30 Church St., New York 7, N. Y.*

Trench Loading Tables—A 28-page booklet of trench loading tables is available to construction engineers and contractors. Reference tables provide adequate data and a quick, easy method of pre-determining loads and strength requirements for clay pipe. Tables show the estimated load according to pipe size, trench depth and width and types of backfill by the standard "Marston" formula. Booklets have been distributed to the company's sales organization in the Great Lakes and northeastern seaboard states. For further information, engineers and contractors in that area may write to—*The Robinson Clay Product Co., Akron 9, Ohio.*

Clutch Catalog—A 16-page, 2-color catalog covers the new Morse-Formsprag full complement over-running clutch, the construction, development and working principle. Engineering designs are given.—*Morse Chain Co., Detroit 8, Mich.*

Single Control Valve—A new publication describes the Hydromatic single control valve, now standard equipment on Cochrone Zeolite softeners and pressure filters. With this valve all the normal functions of a valve nest are integrated and controlled by a single valve.—*Cochrane Corp., 17th St. & Allegheny Ave., Philadelphia 32, Pa.*

Metal Storm Windows—Fenestra inside metal storm windows for residence casements are discussed in a 2-color,

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EQUIPMENT DEPARTMENT
S. C. AUSTIN, EQUIPMENT ENGINEER

RALEIGH, N. C.

E. F. Craven Company
Greensboro, N. C.

Gentlemen:

Att: Mr. F. Duval Craven

I wish to thank you very much for the pictures of two crushing plants in our Asheville Division which you forwarded me on June 27th. In this connection I wish to advise you that we find the General Motors power units used with these crushers to be very satisfactory in operating plants of this type.

Very truly yours,

S.C. Austin

EQUIPMENT ENGINEER.

This rock-crushing plant at Weaverville, N. C., is one of two the North Carolina State Highway Department powers with six-cylinder Series 71 General Motors Diesel engines.

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Sounds unbelievable, doesn't it? But that's just what happened when the North Carolina Highway Department's rock crusher at Weaverville was converted from gasoline to General Motors Diesel power.

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16-page folder. It points out how winterized windows save on fuel and make homes more comfortable. Choice of styles in inside storm windows for various casements are illustrated.—*Detroit Steel Products Co., 3159 Griffin St., Detriot 11, Mich.*

Portable Generators—A 12-page bulletin tells about a complete line of carryable gasoline-engine-driven generators. The bulletin shows in words and pictures the many uses for portable electric power. A check list is given as a guide in selecting units to meet specific requirements. — *Homelite Corp., Port Chester, N. Y.*

Pipe and Fittings—An illustrated booklet on "Karbote" pipe and fittings is available which gives tables of the chemical and physical properties of the material. All pipe sizes and fittings are illustrated and cross-section drawings show dimensions, assemblies, joining recommendations, etc., to aid design work and ordering.—*National Carbon Co., Inc., 60 E. 42nd Street, New York 17, N. Y.*

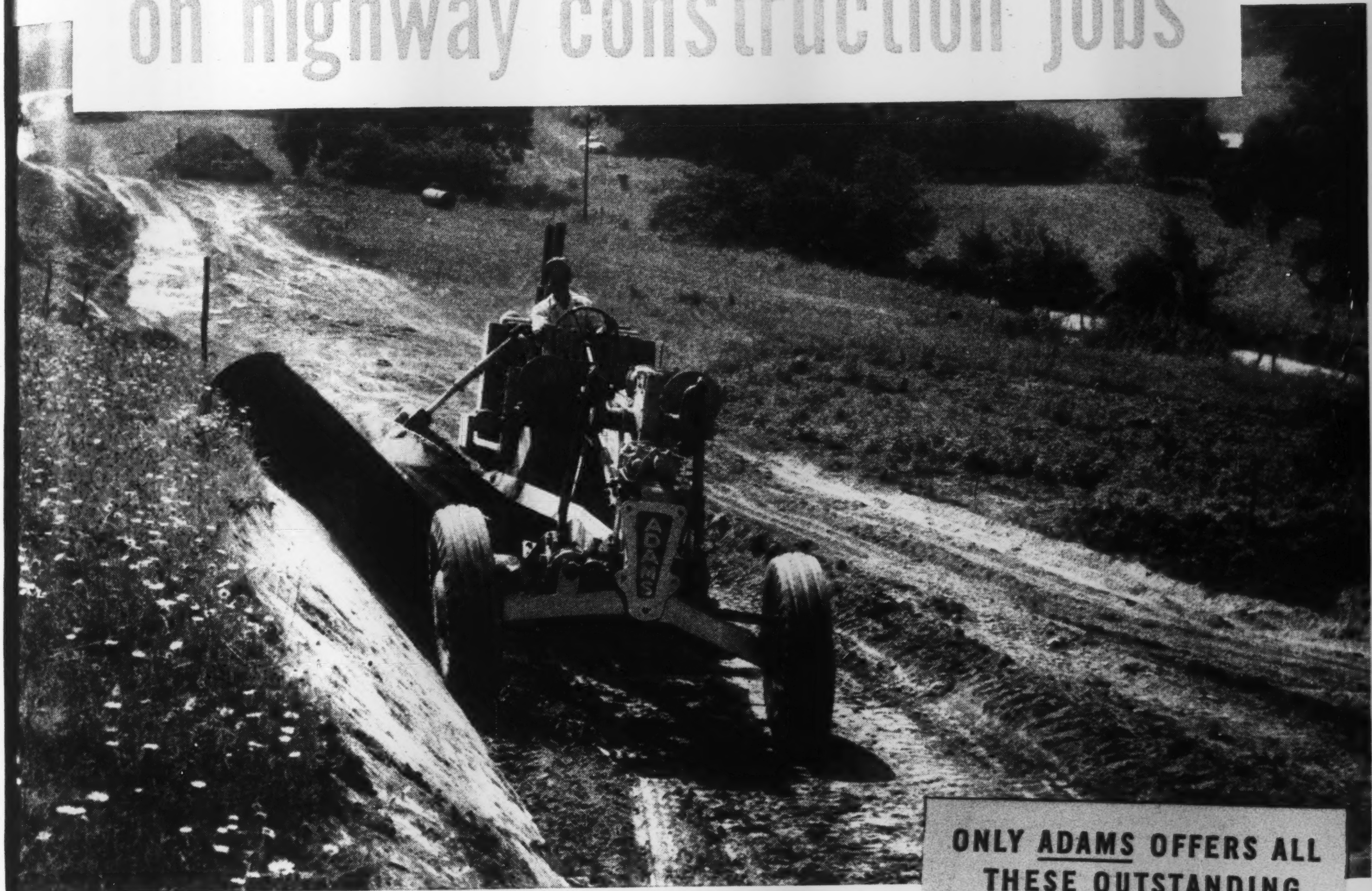
Air Tools—A circular on air tools makes the point that drilling through stone, brick and concrete walls or digging hard ground is a long hard job with hand tools, and it urges the use of air power for excavating, drilling, laying concrete, breaking up rock and masonry, paint spraying and many other jobs.—*Ingersoll-Rand, 11 Broadway, New York 4, N. Y.*

Lettering Guides—The "Wricoprint" lettering guide, one of the many features in this catalog, provides an inexpensive means by which anyone, without skill or previous experience, can do perfect, uniform lettering, easily and quickly.—*The Wood-Regan Instrument Co., Inc., Nutley, N. J.*

Low Heat Welding—An 8-page bulletin announces latest improvements in low heat welding alloys. It stresses the technically improved welding alloys available for all torch and arc users. Also announced is the new "Cuttrode", in size 3/32 in. for cutting thin sheet metal using no special equipment. *Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.*

Power Roof Ventilator—An automatic power roof ventilator is described in a circular. In Verti-Stocks the butterfly dampers open wide the instant the fan is started and the air is exhausted straight upward, blowing foul air, smoke, fumes or dust high above the roof.—*Oliver & McClellan, 30 Church St., New York 7, N. Y.*

Adams advantages pay off on highway construction jobs



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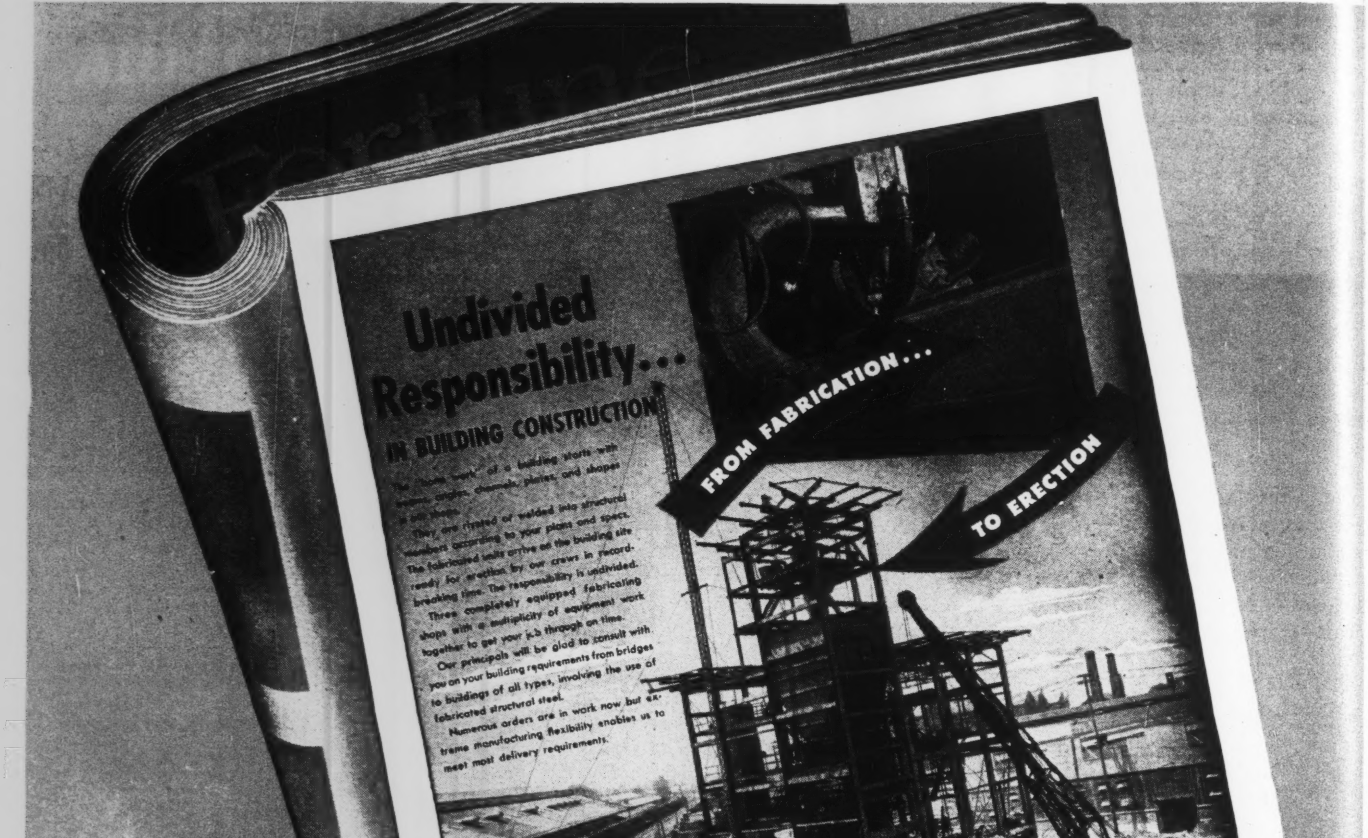
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Steel Tubing—A 32-page bulletin contains information on seamless and welded carbon steel tubing, stainless tubing and pipe, structural tubing, and seamless and welded boiler tubes. It points out the many applications for mechanical tubing; gives information on machining, heat treatment and fabrication; tells how to specify size and quantity; discusses the use of tubing instead of bars for machined parts; and includes reference data such as tubing tolerances, mechanical properties, tempers, decimal equivalents, analyses, definitions, etc.—*Joseph T. Ryerson & Son, Inc., Chicago 80, Ill.*

Water Meters—Operating features of Pittsburgh large capacity disc type water meters are described in a new bulletin by means of phantom view and sectional drawings. Complete specifications and prices for all sizes from 1½-in. to 4-in. are presented in convenient tabular form.—*Pittsburgh Equitable Meter Division, Rockwell Mfg. Co., Pittsburgh 8, Pa.*

Sewage and Industrial Wastes—A 44-page catalog has been compiled to acquaint engineers, superintendents and operators with the many applications of measuring and controlling instruments for sewage and waste processes. Among the instruments described are electric and mechanical flow and liquid level meters, pneumatic remote transmission systems, and many others.—*Brown Instrument Co., Wayne and Roberts Aves., Philadelphia 44, Pa.*

Basepanel Radiation—A folder tells about a system of basepanel radiation designed for beauty as well as economy in domestic radiant heating (for forced hot water systems).—*Brown Electric Co., 96–08 Seventy-Second Ave., Forest Hills, N. Y. C.*

Anti-Corrosion—About 200 standard products for corrosive and high temperature service are listed in a new catalog. Among the standard specialties described are balls, floats, nails, bolts, pipe and pipe fittings, gaskets, valves, wire rope and vibration isolators. —*The International Nickel Co., Inc., 67 Wall St., New York, N. Y.*

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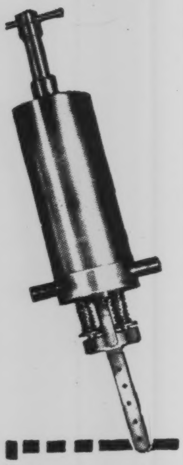

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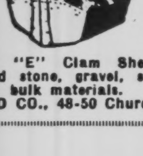

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Personalities—John H. Batten is the new president of the Twin Disc Clutch Co., Racine, Wis., and Rockford, Ill. . . . Ronald A. Johnson is assistant to Paul Brainard, head of the new engineering standards department at the Portland, Ore, plant of the Hyster Co. . . . Wm. Kusz is supervisor of industrial advertising at Caterpillar Tractor Co., Peoria, Ill. . . . Raymond P. Wiggers has been appointed advertising manager of the Frank G. Hough Co., Libertyville, Ill., makers of road building and material handling equipment. . . . Geo. R. Milnc is operating manager of the National Carbide Corp. . . . Ben Conery is advertising production manager for the U. S. Plywood Corp. . . . B. L. Lerch is factory branch manager of the new St Louis office of General Controls. . . . B. F. Bilsland is manager of the midwest region of the general machinery division of Allis-Chalmers Mfg. Co. at Chicago. . . . A. R. Senter is manager of the Ashland, Ky., fabricating division of Armco Drainage and Metal Products, Inc.

Miscellany—Electric Sprayit Co., Sheboygan, Wis., will produce the stationary compressors formerly made by The Auto Compressor Co., Wilmington, Ohio . . . Preco Inc., Los Angeles, has agreed with Caterpillar Tractor

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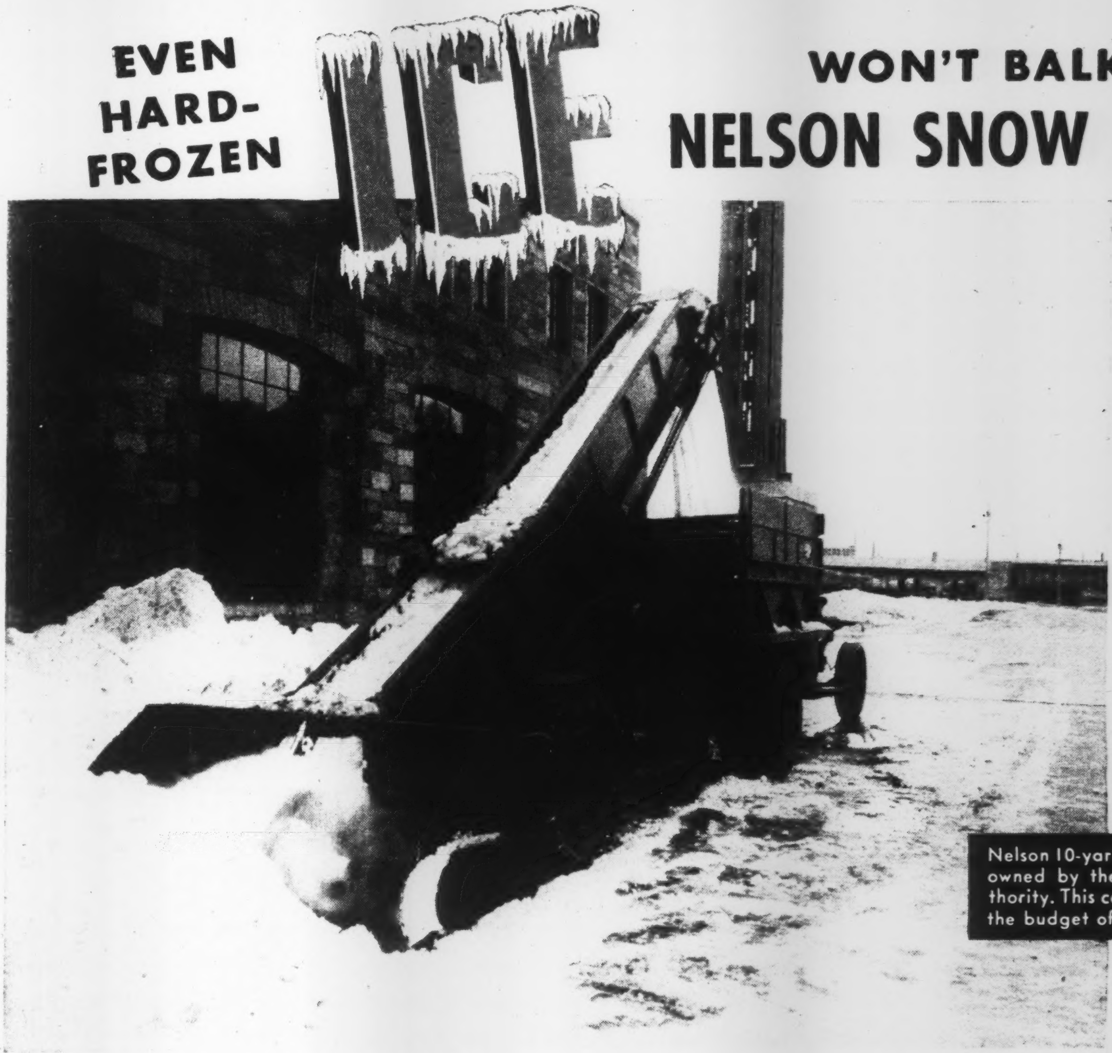

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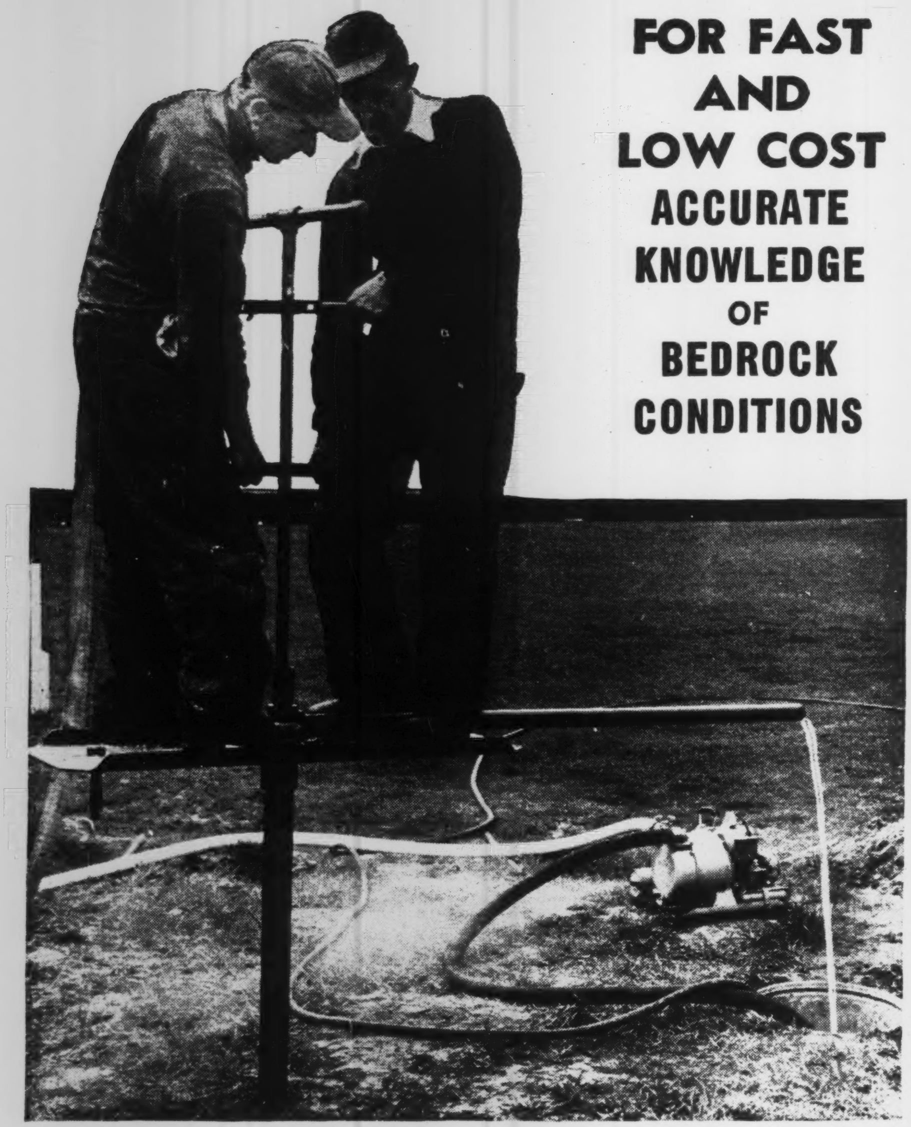

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Co., Peoria, Ill., to manufacture No. 1 and 2 terracers for sale through Caterpillar distribution channels. . . . The 20th anniversary of THE TREMCO MFG. Co. was celebrated recently at Cleveland. The company makes mastic specialties, waterproofings, paints and protective coatings. . . . Production of "golden" plate glass has been resumed by LIBBEY-OWENS-FORD GLASS CO. at its Rossford Ohio, plant. . . . Irving Le Beau, export manager of WISCONSIN MOTOR CORP. is visiting his company's distributors in 15 countries of the Caribbean and Central American areas. . . . A new gray-iron foundry has been occupied by THE HUBER MFG. CO., Marion, Ohio, manufacturers of road building and maintenance equipment. . . . Robt. N. Kelly is the regional field representative of the DOUGLAS FIR PLYWOOD ASSN. at the 500 Fifth Ave., Building, New York 18, N. Y. . . . THE MACHINERY & ALLIED PRODUCTS INSTITUTE has organized a COUNCIL for TECHNOLOGICAL ADVANCEMENT to aid constructive planning in the capital goods industries to emphasize their relationship to national economy. . . . A new $2,000,000 plant addition is under way for the WRIGHT RUBBER TILE Co. in Houston, Tex. . . . A million dollar long-range research program for the brick and tile industry has been proposed to the STRUCTURAL CLAY PRODUCTS INSTITUTE. . . . E. H. KLIEBENSTEIN CO. and TYLER-PREUSSER, INC., have been appointed distributors for Gradall of THE WARNER & SWASEY CO., Cleveland. Kliebenstein will handle sales and service for northern New Jersey, from Hendricks Causeway, Ridgefield, N. J. TYLER-PREUSSER, INC., Boston Post Road, Pelham Manor, N. Y., will service the metropolitan New York and Long Island area.

Deceased—Richard R. Schweitzer, president of LAYNE-ATLANTIC CO., a water development organization, died in Norfolk, Va., recently. . . . Robt. L. Niedringhouse 77, chairman of NIEDRINGHAUS METAL PRODUCTS CO., Indianapolis, Ind., died Oct. 12. . . . Clifton A. Tetherington, 51, secretary and sales manager of the RICHARDS BRICK Co., died at Edwardsville, Ill., Oct. 7.

◆

India—With 65 percent of the test boring completed, the Bombay provincial government hopes to begin work on the giant Koyna Valley multi-purpose project in 1950. However, the $135,000,000 cost of the job has not as yet been arranged. The dam would be about 300 ft. high above streambed, 3,600 ft. long at crest, and capable of providing a 400,000 kw. generative capacity. More than 500,000 acres would be brought under irrigation.

What happens to your drawings?

Is one drawing enough, or do you need copies?

Place your drawing on any one of the many Ozalid sensitized materials, feed it into the Ozalid machine, and you will have a positive (not negative) copy, dry-developed and ready to use, in a matter of seconds!

Do you change or make additions to originals?

Instead of altering or changing your original, do it on a translucent Ozalid print. You can then combine as many changed prints as you wish by putting them on transparent Ozalid film, overlaying them on a sheet of Ozalid sensitized paper, and processing!

Do you want drawings on different weight papers?

Ozalid papers are available in light, standard, and heavy weights. You can even make Ozaprints with reproductions on both sides of the sheet!

Do you want color coded drawings?

Reproduce your drawings on Ozalid papers in black, blue, red or sepia on white or tinted backgrounds. Color code prints for different departments . . . color code different circuits, dissimilar lines or symbols, etc. for greater clarity.

Do you need extra masters?

Make translucent Ozalid Intermediates directly from your tracings for use as "masters" in your printmaking. This saves the original . . . provides "masters" for different departments, branches, contractors, etc. (Ozalid Intermediates are actually better to print from than originals. They increase line density; can be made on new Ozalid plastic surfaces, impervious to stain and smudge.)

If you make drawings—or use them—Ozalid can save you time and money. Write today, and learn more about *how* Ozalid can tighten up lost time and money in your field.

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★ No tie-ups when you shift from one type of print production to another. Simply choose your Ozalid material . . . and your Ozalid Streamliner exposes and dry develops it. Standard work prints are produced in 25 seconds.

★ Your drawings can be up to 42 inches wide, any length. Roll stock or cut sheets can be used. (Special machines accommodate 54" wide drawings.)

★ You—or anyone else—can be the operator. A few hours and you're an "expert."

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DEPT. NO. 208

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Gentlemen: Please send free copy of Ozalid Streamliner booklet illustrating all types of Ozalid prints.

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Ozalid in Canada—Hughes Owens Co., Ltd., Montreal

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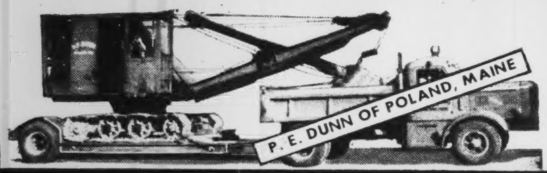

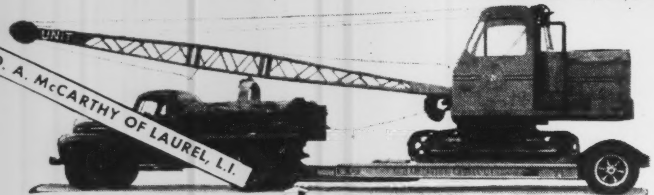

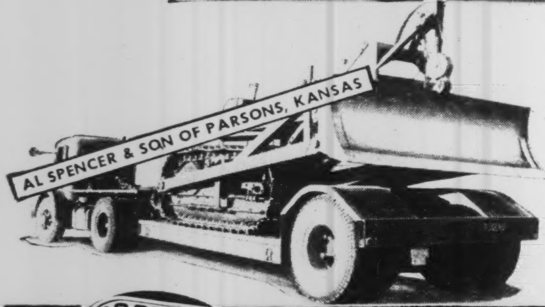

who are profitably hauling light and medium shovels, cranes, bulldozers, etc., to and from the jobs with their dump truck serving as the tractor.

The "Tagalong" front loader loads and unloads from the front after trailer is easily disconnected from the dump truck, and it can be a "one man operation" performed in short time.

Write for literature and prices on this versatile trailer.

ROGERS HEAVY DUTY Gooseneck Trailers

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DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
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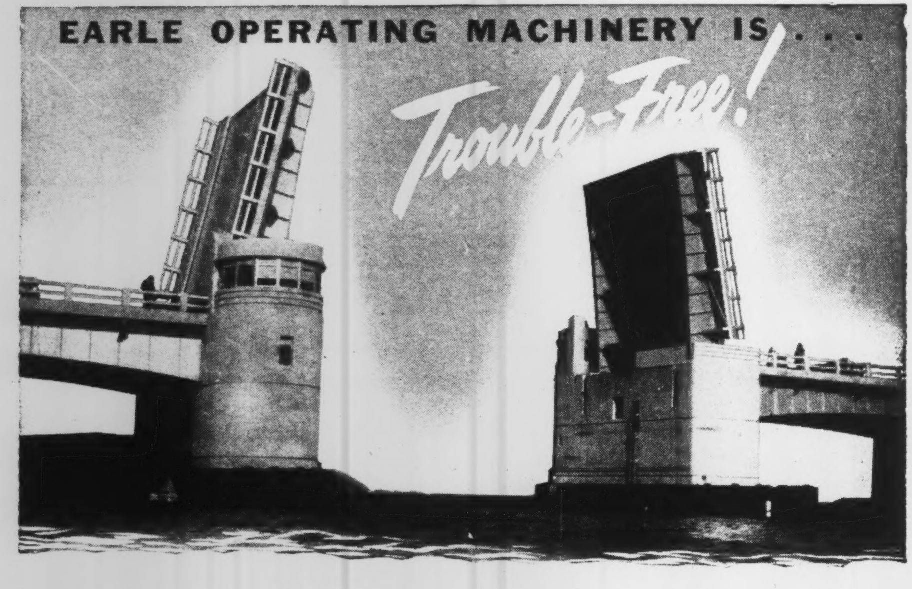
EARLE OPERATING MACHINERY IS . . .



OPERATING machinery for bridge installations, dams, locks and gates should be dependable and positive in action above all else. Earle "oversize" construction and automatic lubrication minimize wear and provide year after year service with little or no maintenance. Backed by years of experience, Earle produces operating machinery that is known as "trouble-free" by bridge and water works engineers who specify it.

Our specialists will gladly work with you to solve your gear or machinery problems—get in touch with us now. If you want further information first, send for our NEW catalog containing Earle operating machinery. The EARLE GEAR AND MACHINE CO., Main Office: 4717 Stenton Ave., Phila. 44, Pa.; Sales Offices: 149 Broadway, N. Y. 6; 901 Davis Ave., Pittsburgh 12, Pa.

INCORPORATED IN EARLE OPERATING MACHINERY

EARLE GEARS

Men and Jobs

Herbert L. Michael, retiring assistant district state engineer, was honored recently at a testimonial dinner in Rochester, N. Y., attended by State Superintendent of Public Works Bertram D. Tallamy and other N. Y. state officials. Mr. Michael joined the department in 1906 after graduation from Tufts College, and in 1909 and 1910 served with the New York City Board of Water Supply in construction of Ashokan Dam. The following year he joined the Buffalo staff of the Public Works Department. In 1916 he was transferred to Syracuse, and went to Rochester five years later as assistant civil engineer. He was made assistant district engineer in 1942.

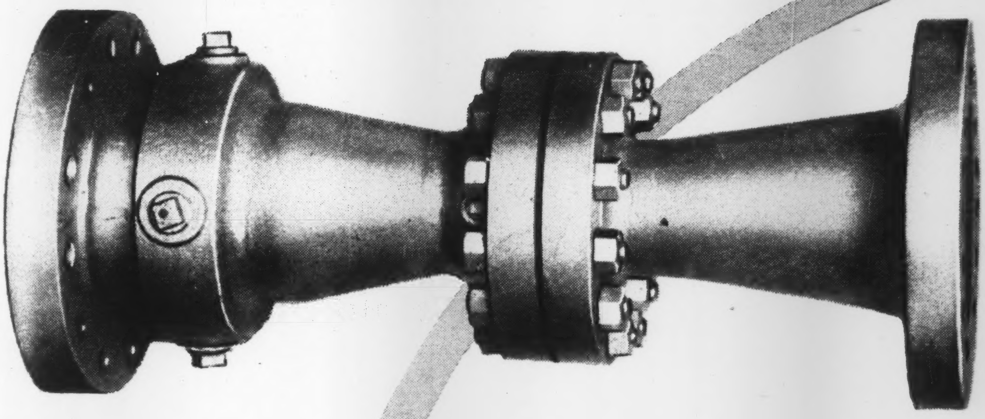
Alexander T. Harris, cadastral engineer for the public survey office, Bureau of Land Management, Boise, Ida., retired Oct. 1 after having been in the service since 1910. He joined in Fairbanks, Alaska, shortly after graduation from the University of Washington. He has surveyed in nearly all of the western states and has had several special assignments at Washington, D. C.

Paul Donahue, assistant city engineer of Virginia, Minn., has resigned to enter business.

Girard Wheeler, principal geologist and formerly chief of the subsurface exploration section of the New York City Department of Public Works, has joined The Giles Drilling Corp., New York, as engineering geologist. He formerly taught engineering geology at Rutgers University and worked with oil companies on geologic surveys.

Frank M. Cortelyou, E. M. Newman and F. M. Cortelyou, Jr., have formed a partnership, Harrington & Cortelyou, consulting engineers, to carry on the practice of the late John Lyle Harrington and Mr. Cortelyou, Sr., at 1001 Baltimore Ave., Kansas City 6, Mo.

J. H. Davies and Associates, consulting engineers, with main offices in Long Beach, Calif., announce the opening of a branch office in Santa Ana, to serve Orange County in a complete structural and civil engineering service, furnishing plans, calculations, specifications and supervision for commercial, industrial and public building construction and for various civil engineering projects **Norman F. Rau,** civil engineer, will be in charge. He is a graduate of the University of California, and has had eight



SIMPLEX

primary devices and meters for greatest accuracy in FLOW MEASUREMENT

Simplex Venturi Tubes provide stable and dependable coefficient data over wide velocity ranges. When used with almost frictionless Simplex Meters a remarkable tank to totalizer efficiency results. An added advantage is the low head loss occasioned by Venturi Tubes when compared with other forms of primary devices.

Simple in design, responsive to slightest differential pressure changes, Simplex Venturi Meters give trouble free operation with minimum maintenance costs.

Write for illustrated bulletins from the Simplex Valve & Meter Company, 6751 Upland St., Philadelphia 42, Pa.

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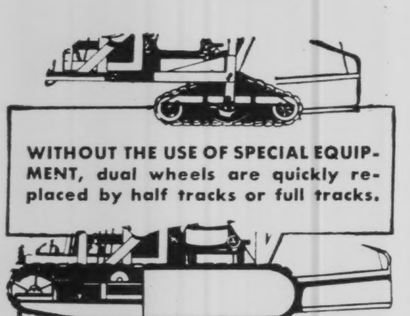
VALVE AND METER COMPANY

cut
TRENCHING
costs!

BADGER
TRENCH EXCAVATOR
FAST, CLEAN, ECONOMICAL
7 to 24 inch width
up to 11 foot depth

Pennies saved per foot of trenching assure more profit dollars per job!

Over fifty advancing speeds equip the one-man *economical* Badger Trench Excavator to operate *in and on* any kind of soil. Patented high speed shovels dig fast and uniformly . . . do not require an unwieldly, bulky machine to assure 'bite' or purchase. Reversible cross conveyor and trench shields keep waste away from trench. Overload safety clutch protects machine and prevents damage as the Badger digs forward or backward, over, under and around obstructions. Ball bearings on all high speed shafts and bronze or babbitt bearings on low speed high torque shafts assure long life dependability.

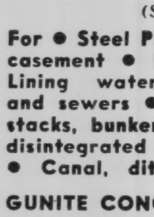


WITHOUT THE USE OF SPECIAL EQUIPMENT, dual wheels are quickly replaced by half tracks or full tracks.

25 MPH ROAD SPEED

Model 202 with rear dual wheels offers cost-cutting mobility of twenty-five MPH road speed. Eight MPH is recommended speed when unit is equipped with tracks or half tracks. All Badger units are easily transported on 1½ ton truck.

Contractors, municipalities and utility companies are cutting costs and boosting profits with the Badger Trench Excavator. Let the Badger dig for profits for you, too!



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Dept. J WINONA, MINNESOTA

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(SINCE 1915)

For ● Steel Plate Lining ● Steel encasement ● Building new walls ● Lining water reservoirs, tunnels and sewers ● Plate lining of steel stacks, bunkers, ducts ● Repair of disintegrated concrete and masonry ● Canal, ditch and drain lining.

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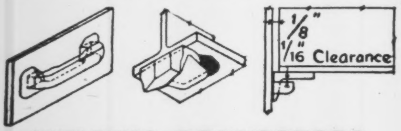

WELDING CONNECTORS
Saxe System Welded Connection Units for welded assembly

Saxe Units place in position and securely hold together structural parts to be welded.

As used in many welded structures they *eliminate all hole punching*, producing an economical, rigid, safe and quickly erected structural frame.

Write for descriptive literature

J. H. WILLIAMS & COMPANY
Buffalo-7, New York
Canadian Representatives
G. D. PETERS CO., Montreal-2, Canada

years experience in engineering design and construction.

Frank S. Altman, district engineer of the Minneapolis, Minn., office of the Portland Cement Association for 26 years, has retired.

Carl E. Fritts of the National Automobile Safety Foundation, has been named supervising engineer for the engineering study of Mississippi's highways and roads. Mr. Fritts has recently completed work as supervising engineer on similar engineering studies for Washington and Oregon.

Cedric A. Roberts, Mantua, Ohio, has been appointed engineer of structures for the Erie Railroad, succeeding the late A. A. Visintainer. He joined the railroad as a junior draftsman in 1930, gradually advancing until he was named resident engineer in 1945.

Harry J. Evans, assistant highway engineer of Goodhue County, Minn., has resigned.

Carl C. Nelson has been appointed engineer of Douglas County, Minn.

Donald D. Ranger has been transferred from Madison, Wis., to the Montana district of the Public Roads Administration to serve under District Engineer L. F. Martin at Missoula.

F. J. C. Dresser, formerly president of the Dresser Co., construction engineers, of Cleveland, Ohio, and more recently a member of the Construction Advisory Board of the War Department and consulting engineer for the Mutual Life Insurance Co. of New York, has announced the opening of an office at 1737 De Sales Street, N.W., Washington, D. C. He will act as consulting engineer for business concerns at home and abroad and will be associated with Robert Leland, president of Leland, Brinckerhoff & Co., Inc. of New York and Washington.

H. G. Wood, formerly field engineer in northwest Ohio, has been named state-wide paving engineer for the Portland Cement Association with headquarters in Columbus.

Clarence S. Gruetzmacher, engineer of distribution of the water department and an engineering employe of Milwaukee, Wis., for the last 40 years, has retired.

Chris Wyller, formerly acting engineer in charge of the Public Roads Administration's division office at Juneau, Alaska, has assumed new duties

Performance is verified *before* BALDWIN TURBINES are BUILT

As every hydraulic engineer knows, *you can't build a turbine out of a textbook!*

In every installation there are a dozen unpredictable variables that must be investigated and evaluated . . . and the results applied to modify and refine the theoretical design.

One primary job of the Baldwin Hydraulic Laboratories is to construct complete homologous model units—including racks, intake case and draft tube—and make painstaking studies of operation under accurately simulated service conditions. Any "bugs" are eliminated at this stage, and the groundwork laid for the top efficiency and outstanding performance that distinguish Baldwin turbines in the field.

Baldwin Turbines are available in Impulse, Francis, Adjustable Blade and Fixed Blade Propeller types to meet every head condition. Capacities range from less than 1 horsepower to over 100,000. Ask for Bulletin 252 for details.

BALDWIN

HYDRAULIC TURBINES

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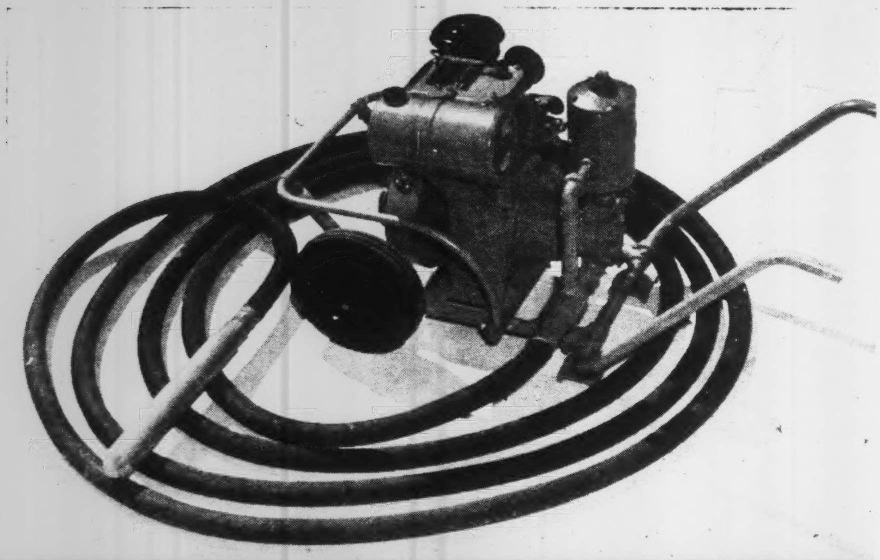
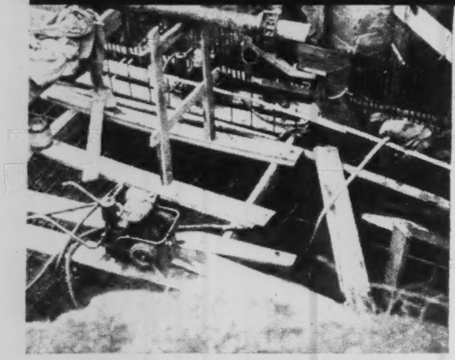
PHILADELPHIA 42, PA.
THE PELTON WATER WHEEL COMPANY
2929 Nineteenth St., San Francisco 10, Cal.

Offices: Birmingham, Boston, Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington. In Canada: Baldwin Locomotive Works of Canada, Ltd., Toronto, Ontario.

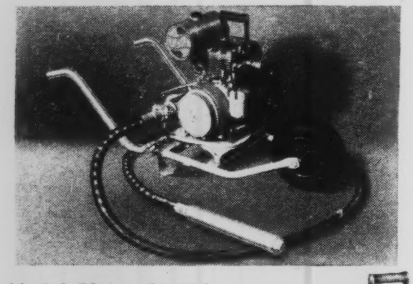


THE JACKSON HYDRAULIC



Saves a "WHOPPING" amount of time and effort!

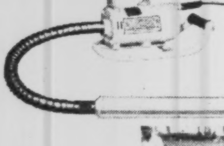
When you place this concrete vibrator, ***with its 50 ft. reach,*** on the job, every bit of concrete poured within a 100 ft. circle can be thoroughly vibrated without changing the location of the machine; the hard-to-get-to places become quickly accessible, non-productive time is drastically cut and the job proceeds faster and more profitably. Tough, trouble-free and highly efficient. Write for complete details.



Model FS-6A. Flexible shaft, Gas-engine drive. Available with 3 heads for thick or thin sections. Flexible shafting in 7' to 14' lengths up to 28', grinding and other attachments.

OTHER JACKSON VIBRATORS TO SOLVE EVERY VIBRATING PROBLEM — PERFECTLY!

Internal and external types — for thin sections to mass construction — highway, airport and municipal paving — product manufacture. See them at your Jackson distributor or write for literature and our recommendation for any particular type of job.



Model FS-7A. Flexible shaft, Electric. Ideal for decks, thin walls and with short shafts for spud work.

MUNICIPAL PAVING UNIT.
Manually guided paving machine and portable power plant. Easily places upward of 65 cu. yds. of stiff mix concrete per hour. Undercuts at side forms. Strikes off to crowns, regular and inverted; works around manholes, etc.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan

as district engineer in Southeastern Alaska with the arrival of **H. O. Stoddard**, recently appointed division engineer. **B. M. French** of Seward will be district engineer in that area.

Raymond G. Hall has been named resident engineer at Akron, Ohio, for the Ohio Department of Public Works, succeeding Bruce J. Cleavenger, retired. Hall received his civil engineering degree from the University of Missouri. He formerly worked for the Akron city highway department and the Firestone Tire and Rubber Co.

James T. Holden, Granville, Ohio, has been named Licking County engineer at Newark, to fill the unexpired term of the late Earl Watkins.

Orin P. Bailey will retire on Nov. 30 as an architectural engineer for the Public Building Administration, FWA, after 15 years service. He has had 50 years experience in various phases of the construction industry—from bricklayer for his father to operating his own companies and working for the government. His projects include the 1,100 x 259-ft. Navy dirigible hangar at Sunnyvale, Calif., and many high schools, hospitals, post offices and power plants. He served in the Spanish-American war, and in the first world war he was assistant chief of hull fabrication, inspector and production expediter at the Hog Island Ship Yard, Philadelphia, Pa.

Eugene W. Weber, special assistant to the Assistant Chief of Engineers for Civil Works, Department of the Army, has been appointed a member of the United States Section of the International Joint Commission, United States and Canada. Mr. Weber has been with the Army Engineers since 1930 and has served as senior engineer with the Board of Engineers for Rivers and Harbors. During World War II he served as a major in the Corps of Engineers and was in charge of administration and supervision of construction of airfields, depots, camps and other military installations in the central portion of the U. S.

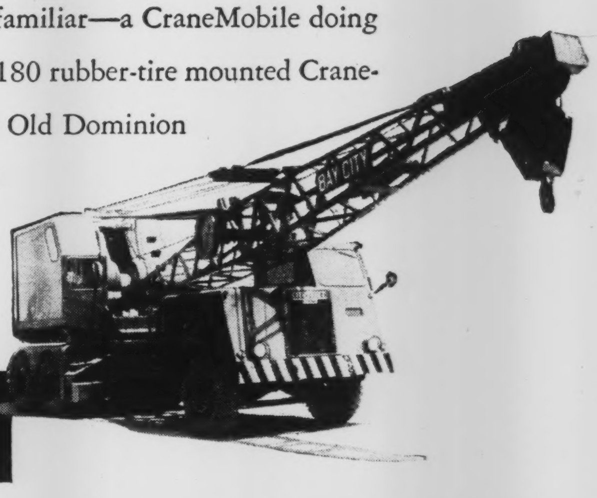
Charles M. Waters, Moline, Ill., chief of the Hennepin Canal section for the Rock Island, Ill., district of the United States Army Engineers, has retired after 48 years on the staff. He was graduated from the University of Michigan in 1900 and immediately went with the Rock Island engineer's office.

Harry Blakeborough has resigned as superintendent of public utilities for Kelowna, B. C. He was city engineer for 40 years, and later was utilities superintendent.

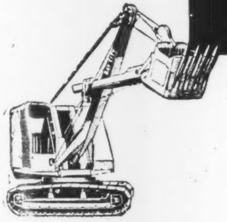
Big Job Made Easier

with a BAY CITY CRANEMOBILE

Here's a sight that is becoming more and more familiar—a CraneMobile doing a fast, efficient job on steel erection. This model 180 rubber-tire mounted CraneMobile having a 20-ton capacity, is working for Old Dominion Hoisting Service on the Pan-American Annex in Washington, D. C.



BAY CITY



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BAY CITY SHOVELS, INC., BAY CITY, MICHIGAN

See your nearest Bay City dealer for excavating and material handling equipment in sizes from ⅜ to 1¼ yards, with crane rating up to 20 tons. Both crawler and pneumatic tire mountings.

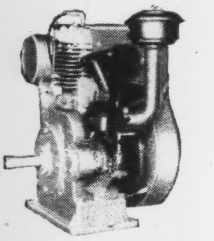
Increase The PRODUCTIVE CAPACITY of Your Mechanized Equipment with WISCONSIN *Air-Cooled* ENGINES

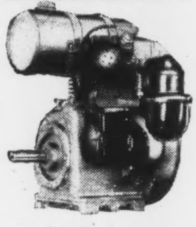
If you build or use any kind of equipment that *is* or that CAN be successfully engine-powered — there is a fairly definite certainty that you can actually increase the productive capacity of the machine by motorizing with a Wisconsin Air-Cooled Engine.

This rather broad statement is predicated on the fact that Wisconsin Engines are notable for continuous, high ratio power output as well as an absolute minimum of maintenance and servicing layups. In addition to the basic advantages of air-cooling, light weight, compact design and all-weather serviceability—you are assured of "Most H.P. Hours" of on-the-job operation, thanks to advanced engineering and heavy-duty design and construction.

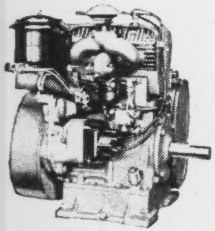
Wisconsin Engines are worth looking into on all counts. Your interest will be heartily reciprocated.

Single Cyl.
4 to 9 Hp.



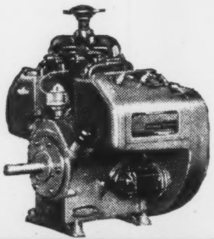


Single cylinder
2 to 5 Hp.



2-cylinder
7 to 13 Hp.

V-type 4-cylinder
15 to 30 Hp.



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WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 14, WISCONSIN

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Stops Rust!

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RUST PREVENTIVE
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Rust-Oleum rust preventive gives lasting protection to metal roofs, stacks, tanks, structural steel, equipment, machinery, boilers, etc. It seals metal with a tough, enduring coating that defies rain, snow, dampness, brine, salt air, etc. Maintenance costs are cut because Rust-Oleum lasts longer, goes on quicker, and requires no extensive surface preparation.

Rust-Oleum can be applied directly over rusted metal. It penetrates the rust and incorporates it into the protective film. No sandblasting, flame cleaning, or chemical dissolvers are necessary. Just wire brush away scale and apply.

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2475 Oakton Street, Evanston, Illinois
Please send free copy of new Rust-Oleum Catalog with recommended uses.

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Elections and Activities

The Connecticut Chapter of the Associated General Contractors of America has elected the following officers: President, Walter A. Hubbell, Bridgeport; vice-president, Earl C. Wheeler, Hartford; secretary, Edward E. Bray, Bridgeport; treasurer, A. Scott Patterson, New Haven; directors, Frank P. Sullivan, East Haven; Richard Goudy, Hartford. Directors were named for a period of three years. C. F. Grisham, Hamden, was named executive vice president.

Arthur N. Beck, director of the Alabama Health Department's Bureau of Sanitation, was presented the Fuller Award at the annual meeting of the Alabama-Mississippi branch of the American Water Works Association. The presentation was made in Montgomery by L. H. Enslow, national president. It was for outstanding work in the waterworks field.

Harry S. Stanton of Wilmington, Del., has been reelected chairman of the Delaware Board of Registration for Professional Engineers and Land Surveyors. Other officers reelected were: Vice-chairman, Thomas B. Evans, Seaford, Del.; and secretary, Thomas J. McDonnell, Wilmington, Del. Additional members of the board are Hyland P. George, Dover; Leo Blumberg, Wilmington, Del.; Arthur G. Livingston, Dover, Del., and Edgar L. Mustard, Georgetown, Del.

The first annual 9-day Houston Construction Industries Exposition, sponsored by the Houston, Tex., chapter, Associated General Contractors, and held in Sam Houston Coliseum Oct. 2-10, had such a large attendance that A. G. C. officials have announced that approximately the same dates will be set aside for next year's exposition. The dates tentatively selected for 1949 are Oct. 3-11. Attendance was 334,297 of which more than half was for the sessions for persons in the construction industry.

Sponsored jointly by the Georgia Water and Sewage Operators Association, Georgia Department of Public Health and the engineering extension division of Georgia Institute of Technology, the 17th annual Georgia Water and Sewage School drew an attendance of 280, including more than 225 water or sewage department superintendents, operators or other employes. W. H.

"Welding permitted fewer supporting columns . . . gave more unobstructed floor area"

DUFFIN IRON COMPANY, FABRICATORS & BUILDERS
DE LEUW, CATHER CO., DESIGNERS

They added: "When designing this Coach Repair Shop for the Chicago, Rock Island and Pacific Railway Company, maximum unobstructed floor area was a prime requisite. Welded construction gave the freedom in architectural and structural design needed. Further, it reduces weight and cost of structural members without decreasing rigidity or structural strength."

For further details about welded construction write for "Manual of Design for Arc Welded Steel Structures" — a 300-page work that brings you information covering design, and engineering control of welding and related operations.

See this invaluable manual for yourself — mail us your check for $2.00, and we will send the book to you . . . look it over for ten days; if at the end of this period it does not completely live up to your expectations, return the book to us and we will return your money.

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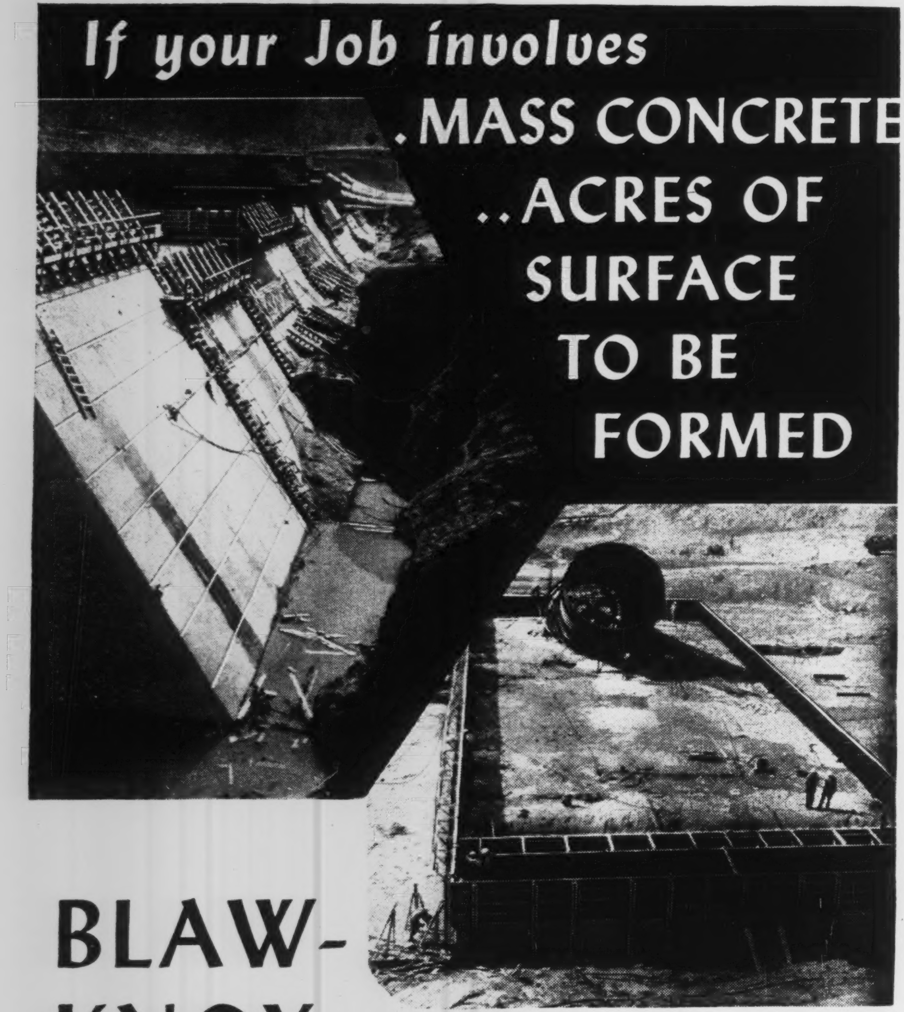

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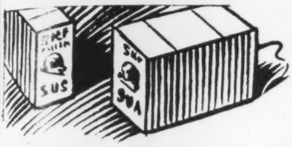
Weir, of the state public health department, cautioned North Georgia communities to make full use of streams rather than to rely on wells for water supply. He said there was a lack of sufficient ground water, and treatment of industrial waste was necessary to insure downstream pure water supply. Mayor Frank Binford of Thomaston presented a detailed account of the various steps necessary in the planning, promotion and financing of a major water and sewage project. D. H. Hurst, city engineer of Tifton, was elected president to succeed B. L. Coburn, superintendent of water of Fitzgerald. Clyde Angle, superintendent of filtration, Celanese Corp., Rome, was named first vice-president, and Van P. Enloe, superintendent of the Clayton sewage plant, Atlanta, was named second vice-president. L. E. Waller, superintendent of South River sewage plant, Atlanta, was named secretary-treasurer.

Thomas R. Lathrop, of the Ohio Department of Health, has been elected chairman of the Ohio section of the American Water Works Association. A. A. Urlich, Massillon, was elected vice-chairman, and F. P. Fischer, Cleveland, was renamed secretary-treasurer.

Members of the Buffalo, Syracuse, Ithaca and Rochester, N. Y., sections of the American Society of Civil Engineers met at Letchworth State Park in Western New York recently for a park inspection and outing. They were joined by the Niagara Peninsula Branch of the Canadian Institute of Engineers. The party inspected Mount Morris Dam in the gorge of the Genesee River. This dam will be the largest gravity dam in the East. Speakers included Col. Herbert D. Vogel, Corps of Engineers, in charge of construction work at Mount Morris; Prof. Carl Crandall of Cornell University, senior park engineer of New York State, and Col. Harland C. Woods, a director of the society from the Buffalo Section.

Officers of the American Institute of Steel Construction have been elected as follows: President, N. R. Patterson, president of the Patterson Steel Co., Tulsa, Okla; 1st vice-president, R. D. Wood, Chicago; 2nd vice-president, J. Phillip Murray, San Francisco; treasurer, John E. Jackson, Pittsburgh, Pa.; executive vice-president, L. Abbett Post, New York; and secretary, M. Harvey Smedley, New York.

James F. Shiveler has been elected president of the Engineering Professions Club of Jacksonville, Fla.; John E. Baker, vice-president; John B. Miller, secretary; Robert E. Walker, treasurer; and Walter J. Parks, programs



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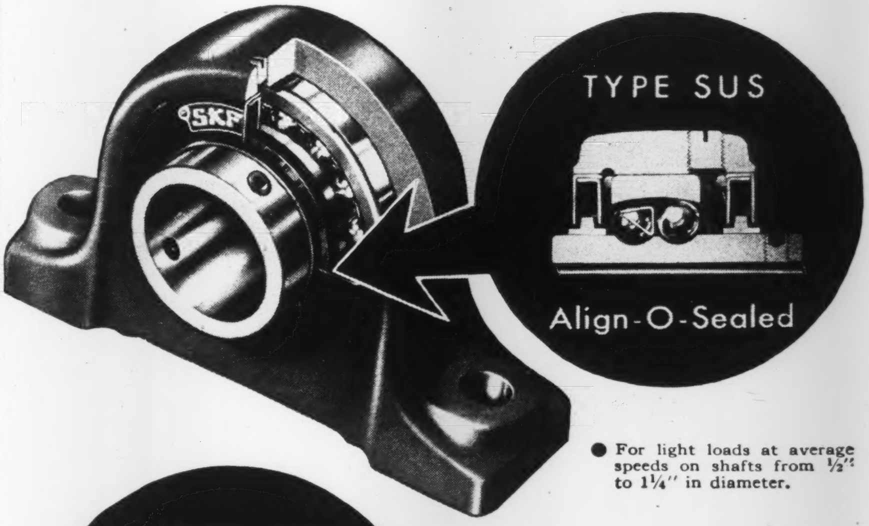

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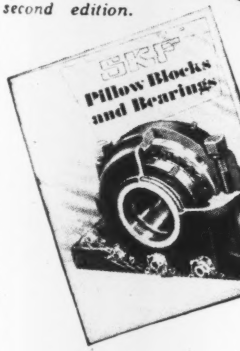

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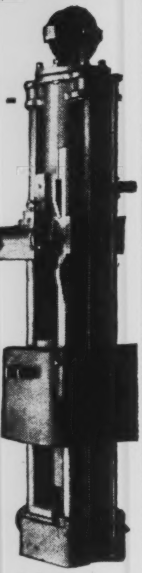

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New Engineering Books

(Continued from page 112)

Education for Professional Responsibility—A report of the Proceedings of the Inter-Professions Conference on Education for Professional Responsibility held at Buck Hill Falls, Pa., April 12-14, 1948. 207 pp. Carnegie Press, Carnegie Institute of Technology, Pittsburgh 13, Pa.

Elementary Statistical Analysis—By S. S. Wilks. 284 pp. Princeton University Press, Princeton, N. J. $2.50.

Big Freeze—(The biography of an imaginary young engineer on the New York water supply work)—By Bellamy Partridge. 236 pp. Thomas V. Crowell Co., New York 16, N. Y. $2.75

Reports and Pamphlets

Transit Fact Book—1948—American Transit Assoc., 292 Madison Ave., New York 17, N. Y.

Deterioration of Structures of Timber, Metal, and Concrete, Exposed to the Action of Sea-Water—By J. Bryan. 19th Report of the Committee of the Institution of Civil Engineers. Copies obtainable from William Clowes & Sons, Ltd., Little New Street, E. C. 4, London, England. 5s.

Shell Concrete Construction—Technical Paper No. 6—The Reinforced Concrete Assoc. 94/98 Petty France, London, S. W. 1, England. Price 2s6d.

Evaporation from Water Surfaces in California—Bulletin No. 54-A—Dept. of Public Works, Division of Water Resources, Sacramento, Calif.

Compendium of State Research Activities—Maryland State Planning Commission, 100 Equitable Building, Baltimore 2, Md.

Colombia as a Present and Potential Market for Road Building Machinery and Allied Equipment and Parts—By B. P. Root. American Road Builders' Association, 1319 F. St., N. W., Washington 4, D. C.

Problems of Ground Transport to Growing Air Terminals—By R. Ramspeck—Reprinted from the July 1948 issue of *Traffic Quarterly.* American Road Builders Association, 1319 F. St. N.W. Washington 4, D. C.

Major Storage Reservoirs of Virginia—Bulletin No. 9—By Orvil D. Mussey. Virginia Conservation Commission, Division of Water Resources and Power, Charlottesville, Va.

Report of Committee on Calcium Chloride Soil Stabilization—Technical Bulletin No. 127—American Road Builders' Association, Washington 4, D. C.

Report of Committee on Asphalt Emulsion Soil Stabilization—Technical Bulletin No. 138—American Road Builders' Association, Washington 4, D. C.

Report of the Committee on Treatment of Icy Pavements, Snow Removal, Etc.—Technical Bulletin No. 145—American Road Builders' Association, Washington 4, D. C.

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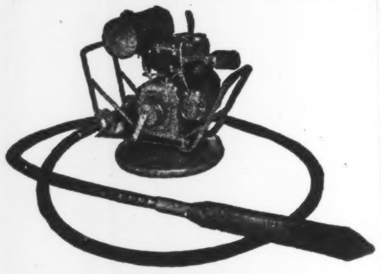

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Highway Finance—Bulletin No. 12—Five Papers Presented at the Twenty-Seventh Annual Meeting, Highway Research Board, Washington 25, D. C. 75c.

Rates of Sediment Production in Midwestern United States—By Gunnar M. Brune. U. S. Department of Agriculture, Soil Conservation Service, Milwaukee, Wis.

Plans for Elimination of Shoaling in New Castle-Finns Point Ranges Delaware River—Technical Memorandum No. 2-259—Waterways Experiment Station, Vicksburg, Miss. $1.

Empirical Verification of Transference Equations in Laboratory Study of Breakwater Stabiity—Bulletin No. 31—Waterways Experiment Station, Vicksburg, Miss. $.50.

Laboratory Research Applied to the Hydraulic Design of Large Dams—Bulletin No. 32—Waterways Experiment Station, Vicksburg, Miss. $1.

Laws Relating to Sewers and Sewage Treatment for Cities and Towns and Sewer Districts—Report No. 87—Prepared by Ernest Howard Campbell. Copies obtainable from University of Washington Press, Commerce Hall, Seattle 5, Wash. $2.

Proceedings of the Third Annual Meeting of the National Conference on Industrial Hydraulics—National Conference on Industrial Hydraulics, Armour Research Foundation, Technology Center, Chicago 16, Ill.

Cavitation and Pressure Distribution: Head Forms at Zero Angle of Yaw—Bulletin 32—State University of Iowa, Iowa City, Iowa.

Groundwater Resources in Winnebago County with Specific Reference to Conditions at Rockford—State Water Survey Division, Urbana, Ill.

Interpretation of Soap Savings Data—Circular No. 26—State Water Survey Division, Urbana, Ill.

Service Records for "Wolmanized" Treated Lumber—American Lumber & Treating Co., 332 South Michigan Ave., Chicago, Ill.

Aerodynamics of Suspension Bridges By D. B. Steinman, Consulting Engineer, 117 Liberty St., New York 7, N. Y.

Studies in Cement-Aggregate Reaction, VII.—The Effect of Storage Conditions on Expansion and Tensile Strength Changes of Mortar. (Reprint from the *Journal* of the Council for Scientific and Industrial Research, Vol. 20, No. 4, November, 1947). Division of Industrial Chemistry, Council for Scientific and Industrial Research, Lorimer St., Fishermen's Bend, S. C. 8, Australia (P. O. Box 4331).

Cottonseed Hulls an Insulating Material—Research Report No. 2—Texas Engineering Experiment Station, College Station, Texas.

Hidden Hazards—A guide to help you make your home safer through the selection of proper materials and proven methods of construction—Insurance Company of North America Companies, 1600 Arch St., Philadelphia 1, Pa.

Durability of Concretes and Mortars in Acid Soils with Particular Reference to Drain Tile—Technical Bulletin 180—

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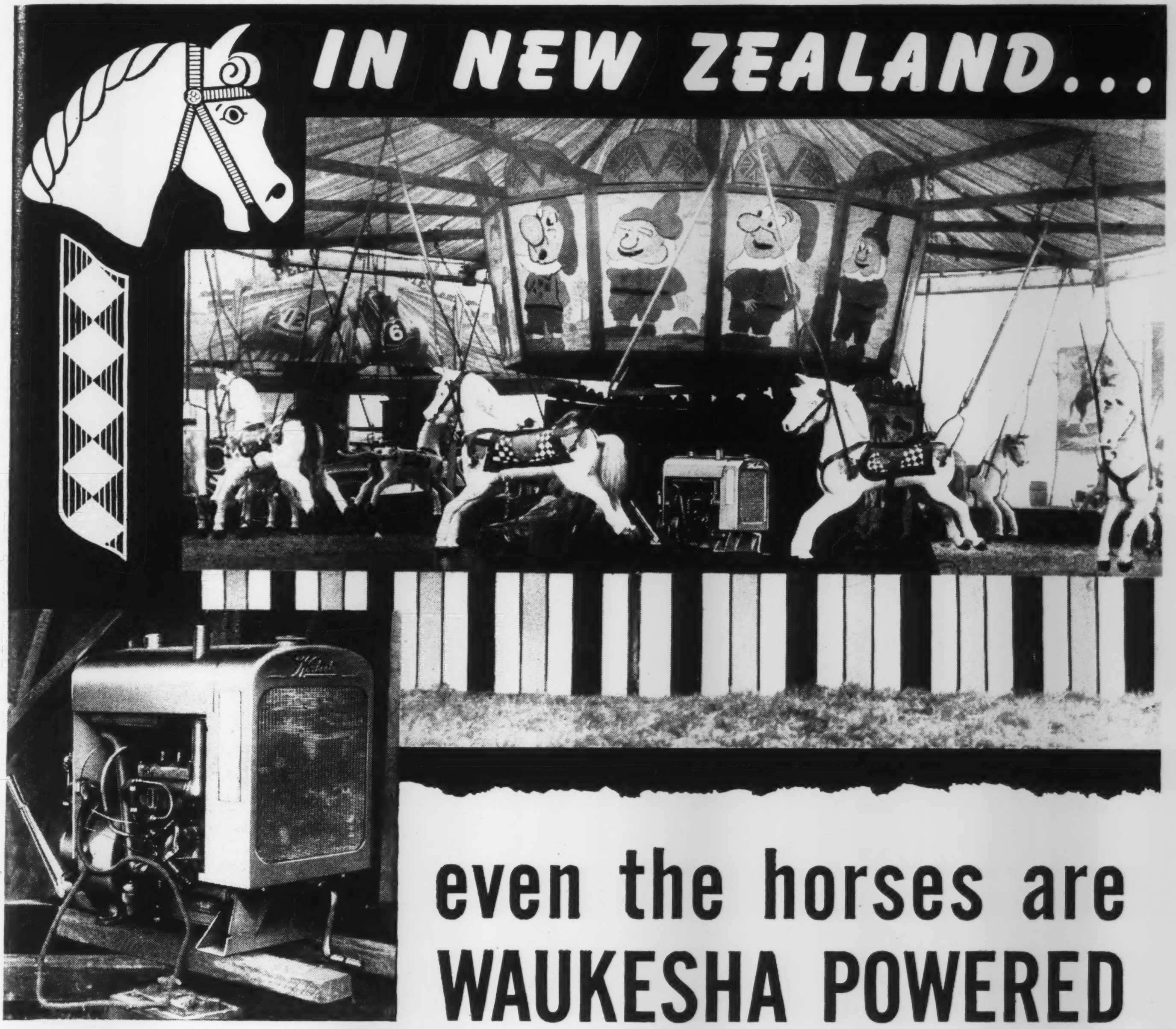

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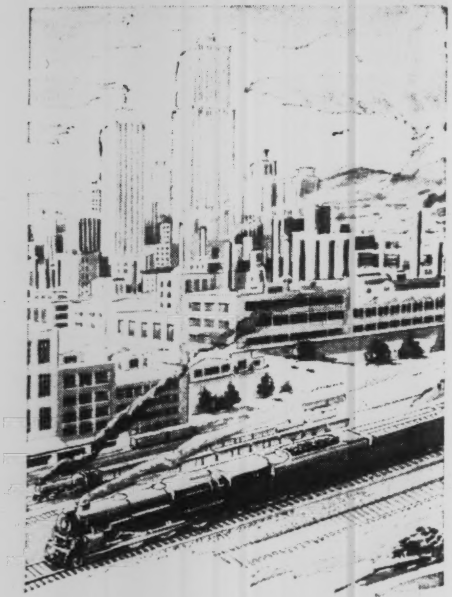

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University of Minnesota, Agricultural Experiment Station, St. Paul 8, Minn.

Clay Building Bricks—National Building Studies, Bulletin No. 1—His Majesty's Stationery Office, London. Price 1s.

Painting New Plaster and Cement—National Building Studies, Bulletin No. 2—His Majesty's Stationery Office, London. Price 1s.

Plumbing in America—National Building Studies, Special Report No. 3—His Majesty's Stationery Office. Price 1s. 3d.

Sand-Lime Bricks—National Building Studies, Special Report No. 3—His Majesty's Stationery Office, London. Price 1s 3d.

An Analysis of Future Housing Demand—By Miles L. Colean, The Producers' Council, Inc., Washington 5, D. C.

Properties of Some Lightweight-Aggregate Concretes With and Without an Air-Entraining Admixture — Building Materials and Structures Report BMS-112—National Bureau of Standards, Supt. of Documents, Washington D. C. Price 10c.

Transactions 35th National Safety Congress—Construction Section — National Safety Council, Inc., 20 No. Wacker Drive, Chicago 6, Ill.

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Committee Report Soil-Cement Stabilization—Technical Bulleting No. 137. American Road Builders' Association, International Building, Washington 4, D. C.

Planning Reports—A Compilation of Reports on Planning Activities in the District of Columbia-Maryland-Virginia Area—Technical Bulletin No. 139. American Road Builders' Association, International Building, Washington 4, D. C.

Tar Soil Stabilized Base Courses—Technical Bulletin No. 148. Sponsored by Committee on Tar-Soil Stabilization. American Road Builders' Association, 1319 F Street, Northwest, Washington, D. C.

A Year Book of Railroad Information—1948 Edition—Eastern Railroad Presidents Conference, Committee on Public Relations, 143 Liberty St., New York 6.

Local Planning and Zoning—A Manual of Powers and Procedures for Citizens and Governmental Officials. Bureau of Planning. Department of Commerce, Albany, N. Y.

Chemical Character of Surface Waters of South Carolina 1945-47—Bulletin No. 16. South Carolina Research, Planning and Development Board, Columbia, S. C.

Determination by Moment Distribution of the Reactions and the Moments Arising from the Expansion of Piping Systems—Bulletin No. 3. Engineering Experiment Station, Montana State College, Bozeman, Mont.

The Boston Society of Civil Engineers and its Founder Members—By John B. Babcock, 3d. Department of Civil and

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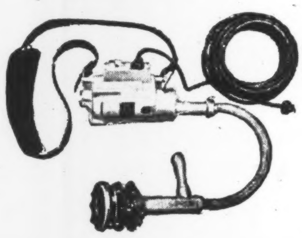

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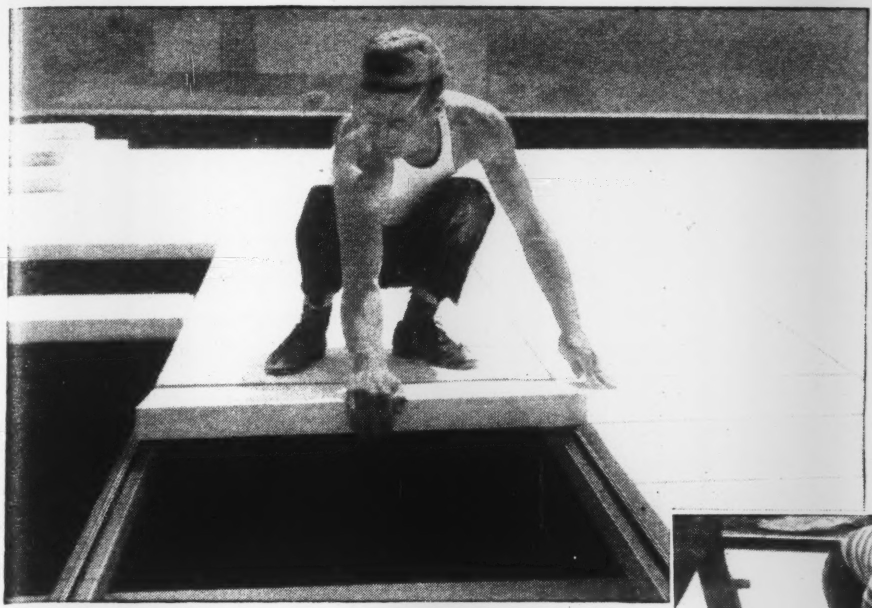

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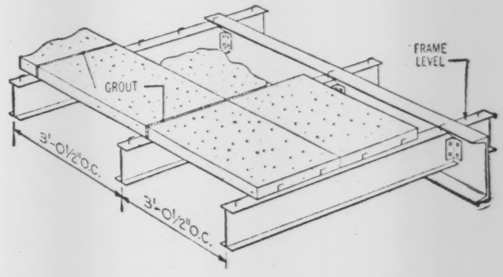

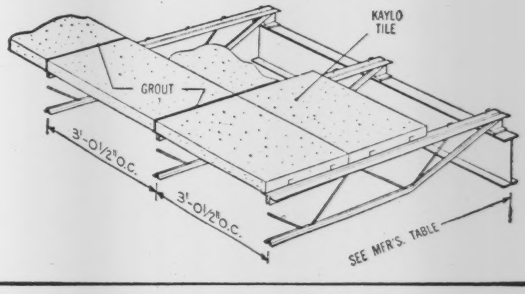

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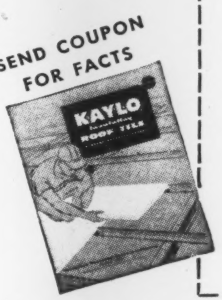

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Sanitary Engineering, Massachusetts Institute of Technology, Cambridge 39, Mass.

WATER PERMEABILITY OF STRUCTURAL CLAY TILE FACING WALLS—Bulletin No. 27, Engineering Experiment Station, University of Minnesota, Minneapolis, Minn.

POTOMAC BASIN ZONING REPORT. W. Va. Water Commission, Charleston 1, W. Va.

Miscellaneous Notes on Booklets and Reprints

REGISTRATION LAWS for engineers are discussed in a pamphlet entitled "Professional Registration Laws and the Engineer" written by A. M. Sargent, president and general manager of the Pioneer Engineering & Manufacturing Co. (Copies can be obtained from Jno. M. Cannon Associates, Penobscot Bldg., Detroit 26, Mich. for 75c.) Mr. Sargent points to the weakness of most license laws resulting from their all-inclusive definitions of engineering, and urges more precise definitions. Also, he is opposed to attempting to make application of license laws mandatory for engineers whose work does not come within the more accurate definitions.

COST-CUTTING TECHNIQUES for small-house construction developed by the University of Illinois and the U. S. Department of Commerce Office of Technical Services are described in a 12-page, non-technical, illustrated circular that may be obtained free, and a technical report, with tables of man-hour studies that may be purchased for $2.50 from the Small Homes Council, University of Illinois, Urbana, Ill. Among the money-saving procedures presented are coordination of dimensions, with a basic modular unit of 4 in.; building the house as one room and then installing non-load bearing partitions; and the use of precut and pre-assembled wood roof trusses, stairs, interior partitions and exterior walls.

"FLOOD FLOWS and Stages in Sacramento (California) and Northern San Joaquin Valleys, 1946-48" presents descriptive and historical information on 109 stream gaging stations in that state together with an account of the functioning of the Sacramento River flood control project between the fall of 1946 and the spring of 1948. Division of Water Resources, P. O. Box 1079, Sacramento, Calif.

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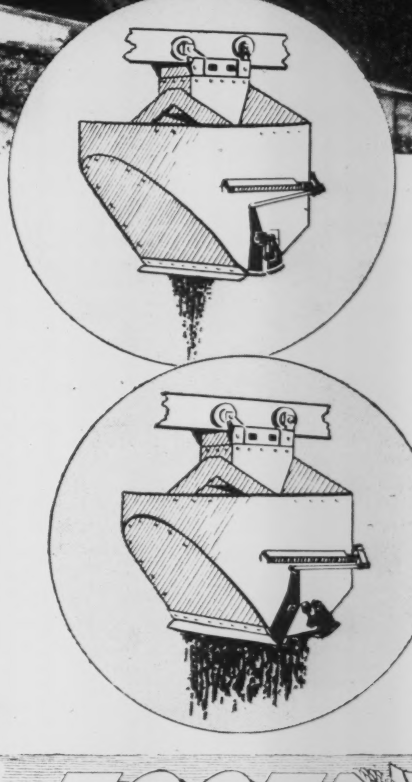

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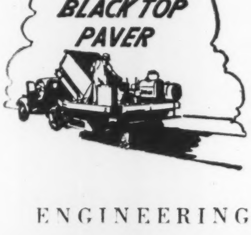
Here is an answer to those jobs involving narrow forms, narrow openings to spouts or pumpcrete. Cable control assures positive, smooth operation without fear of control failure.

In conjunction with the MultiFoote Elevating Boom, contractors have the answer to a wide range of pouring problems, an answer that will cut costs by the elimination of cranes, ramps, much false work and in some cases shooting towers and other equipment. Your MultiFoote will put concrete over 23 ft. up with the bucket clear for pouring. The MultiFeed Doors will pour to the narrowest form.

Ask for details. Let us tell you how the MultiFoote will save money on all kinds of construction jobs. It will pay you to investigate.



Ask about the Adnun Black Top Paver, the only paver of its kind that will lay black top, stone and cinders.

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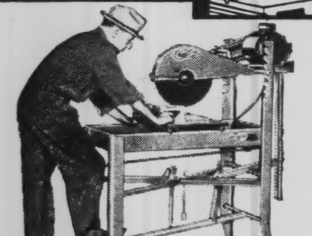

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No dust. With foot pedal control or without. You can set the cutting head in locked position. The hardest materials cut with ease.

FAST *and* FLEXIBLE
The New Model HD-48 Clipper cuts dry just exactly the same as regular Clipper Masonry Saws.. and for Dustless masonry cutting just turn on the circulating system and slice thru the hardest materials. Proven by ten years use throughout the world. Guaranteed to provide the fastest cuts with lowest cost.

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Engineering Schools

New Technical Institute

There are plans at Raleigh, N. C., for the establishment of a technical institute as a part of N. C. State College. It would offer a wide range of training for young men who are unable to enter the four-year college courses. It is designed to increase the supply of skilled personnel in North Carolina. Among those backing the proposal are Dean J. H. Lampe, of the college's school of engineering; W. H. Rogers, Jr., assistant to the chairman of the N. C. State Highway and Public Works Commission; W. C. Fitzgerald of Raleigh, an official of the Peden Steel Co.; C. T. Hutchins of Durham, representing the William Muirhead Construction Co.; Worth D. Kenyon, Raleigh contractor; and Warren J. Mann, of Raleigh, secretary-treasurer of the Carolina Road Builders Association.

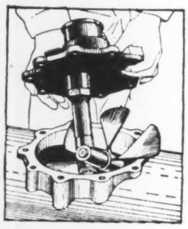
New Courses

The engineering department of the University of California at Los Angeles added two new courses this fall in soil mechanics, both dealing with principles and structural applications. The work is directed by C. Martin Duke, assistant professor of engineering, and D. P. Krynine, visiting professor of engineering, formerly of Yale University, who has just returned from Rotterdam, Holland, where he attended the second international congress on soil mechanics as a member of the research and development board of the National Military Establishment.

A new optional course in construction engineering to train executives for the construction industry has been inaugurated in the department of civil engineering at Washington University, St. Louis, Mo. It covers construction, accounting, soils, estimates and costs, planning and organization, contracts and specifications, construction methods, labor problems, engineering law, and fundamental design in steel, reinforced concrete, and water supply and sewage. The large volume of construction in the St. Louis area provides laboratory facilities. Local contractors will give special lectures. The Master Builders' Association of St. Louis assisted in the organization of the course.

The Oklahoma state highway department has a plan to recruit high school graduates to take an 8-weeks course for draftsmen at the engineering school of Oklahoma A & M College in order to take positions in the department.

SPARLING MAIN-LINE
METERS



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of Main-Line Flows

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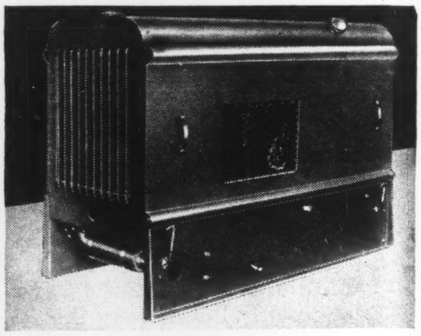

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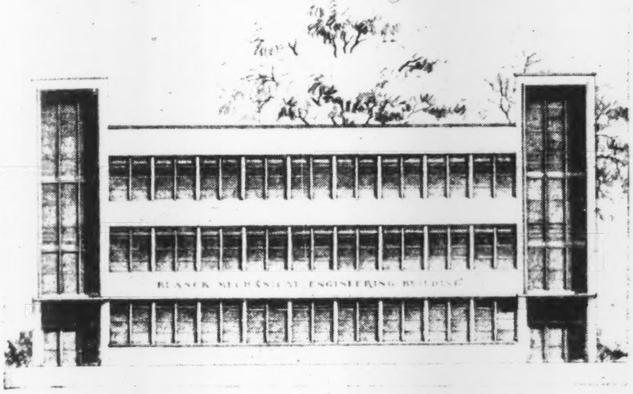
How Arc Welding Simplifies Erection of Three-Story Building

By C. B. Rowley, President

Charles Bacon Rowley & Associates, Inc., Architects and Engineers, Cleveland, Ohio



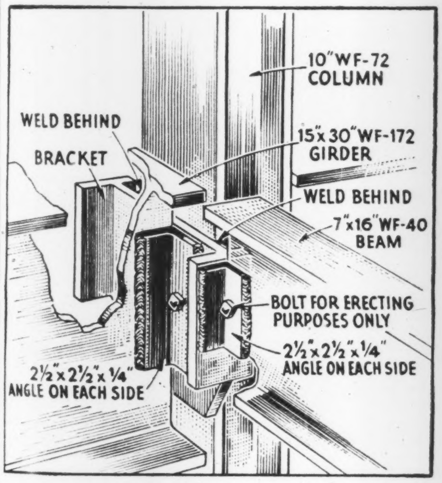
Fenn College Mechanical Engineering Building. Architects and Engineers: Charles Bacon Rowley & Associates; Structural Engineers: Frank Eroskey and Associates; General Contractors: Albert M. Higley Co.; Steel Erectors: Vogt & Conant; Steel Fabricators: Burger Iron Co.

Completing column splices on 10″ WF 66 and 10″ WF 72 columns. Splice plates are ½″ x 2′ long and 1½″ narrower than column flange.

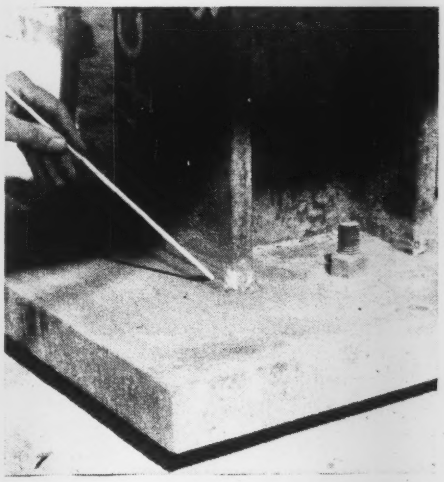
THE 130-ton steel framework for the new Fenn College Mechanical Engineering Building was arc welded by two men in 10 days and at an appreciable saving in cost, based on a comparison of bids involving riveted construction. In addition to faster, lower-cost construction, arc welding permitted quiet erection, avoiding interference with school activities in the adjacent college building.

Under construction at Cleveland, Ohio, this building is the first step of a long range expansion of Fenn College facilities. The new 100′ x 99′ structure will contain eight classrooms, two drafting rooms, mechanical shops and locker facilities.

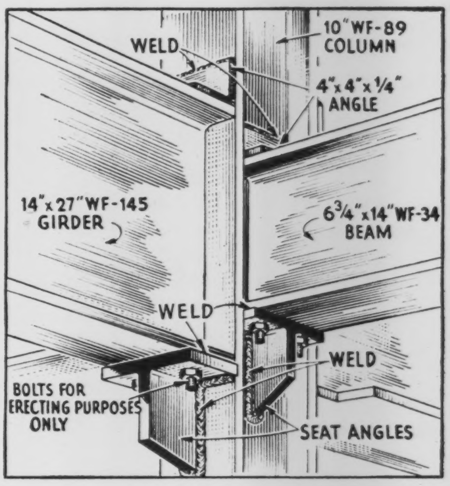
In the design of structural members, maximum use of shop welding was made to permit faster, easier downhand welding using high welding currents and increased electrode speeds. The 130-ton steel structure was bolted, plumbed, guyed and made ready for arc welding in five days. It was then arc welded with 5/32″ diameter "Fleetweld 5" electrode, using two 200-amp. Lincoln "Shield-Arc" engine driven welders.


10"WF-72 COLUMN
WELD BEHIND
BRACKET
15"x30"WF-172 GIRDER
WELD BEHIND
7"x16"WF-40 BEAM
BOLT FOR ERECTING PURPOSES ONLY
2½"x2½"x¼" ANGLE ON EACH SIDE
2½"x2½"x¼" ANGLE ON EACH SIDE

Unique beam-girder-column connection. Bracket is cut from 21″ WF 112 "I" beam. This offsets the beam from the center-line of the column.



Base-column connection. Column is milled square and shop welded to 16″ x 28″ x 3″ steel plate base. Anchor bolts are 1″ x 24″ long.


WELD
10"WF-89 COLUMN
4"x4"x¼" ANGLE
14"x27"WF-145 GIRDER
6¾"x14"WF-34 BEAM
WELD
WELD
BOLTS FOR ERECTING PURPOSES ONLY
SEAT ANGLES

Another typical connection between beam and column. Seat angle shown at right cut from 21″ WF 96 "I" beam and fillet welded to column web. Seat angle at left welded to column flange is cut from 14″ WF 43 "I" beam.

The above is published by LINCOLN ELECTRIC in the interests of progress. Architects and engineers are invited to write on their letterheads to be placed on mailing list for Structural Welding Studies. Write The Lincoln Electric Company, Dept. 139, Cleveland 1, Ohio. **Advertisement**

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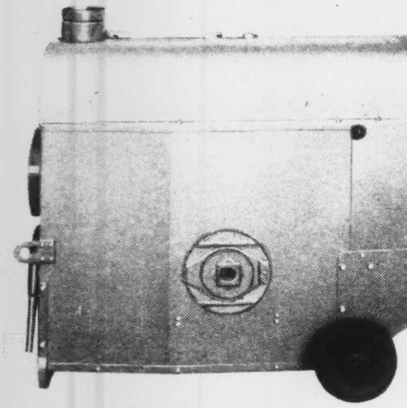

THE NEW HERMAN NELSON De Luxe Model Portable Heater

- Provides Quick, Clean, Safe Heat—*without* smoke, soot or open flame.
- Abundant *fresh*, heated air—*forced* to areas where most needed.

Full 250,000 BTU per hour capacity—enough to heat three ordinary 5-room houses!

Burns range oil, kerosene or prime white distillate — costs less than 39c per hour!

Electric motor powered; 115-230 volt, 60 cycle, single phase.

Automatic, constant spark ignition! Two 12" dia. x 12' long, extendable hot air ducts.

Streamlined appearance. Two-tone finish.

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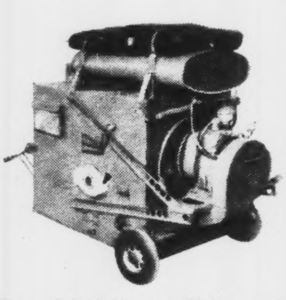

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From Nov. 15 to 20, a short course for technicians in the sand and gravel and ready mixed concrete industries will be given at the University of Maryland, College Park. Tentatively, the course will include: Basic factors affecting quality of concrete mixtures; air-entraining concrete; fundamentals of design of concrete mixtures; laboratory demonstrations and discussions regarding concrete including tests of aggregates; aggregate specification problems, and bituminous mixtures.

Educational Briefs

Indiana Technical College, Fort Wayne, Ind., has been reorganized on a non-profit basis, announced President A. T. Keene. The changeover will pave the way to the institution becoming an accredited college. In its new program, the college will be able to confer both M. S. and B. S. degrees in civil, aeronautical, chemical, electrical, and mechanical engineering.

Prof. C. D. Williams, head professor of civil engineering at the University of Florida, has received a joint award of $5,000 from the Lincoln Foundation for his textbook "Structural Design in Metals", written in cooperation with Prof. E. C. Harris of Fenn College, Cleveland, Ohio.

The Agricultural and Mechanical College of Texas completed recently the organization of an advisory committee on construction engineering, consisting of more than 20 representatives of Texas chapters of the Associated General Contractors of America.

The new $863,000 civil engineering building being erected at the University of Tennessee, Knoxville, will be named Perkins Hall, as a memorial to the late Charles A. Perkins, professor of physics and electrical engineering for 49 years before he retired in 1941.

Two new dormitories, the latest structures in Illinois Institute of Technology's $15,000,000 development and modernization program, have been completed and are now in use.

A new hydraulic testing machine capable of stressing structural materials to a maximum tension or compression load of 200,000 lb. will be installed at the New York University college of engineering. The machine will also be used by graduate students in civil engineering for studies on strength of materials which cannot be handled adequately on the 60,000-lb. machine now in service in the department.